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HARTER ACT.

The construction which the courts are giving to the act of Feb. 13, 1893, commonly known as the Harter act, so limit the exemption from liability as to leave the carrier practically in the same condition that he was before the passage of the act. The layman's understanding of the purpose of the act was that the second section, prohibiting him from inserting in his bills of lading or shipping document any covenant or agreement intended to relieve him from the obligation to exercise due diligence, properly equip, man, provision and outfit his vessel, and to make her seaworthy, was to be compensated for by the provisions of the third section, that if he had exercised "due diligence" to make his vessel in all respects seaworthy, etc., he should not be liable for damage to cargo arising from a deficiency in these regards. The language of the act, however, is that if he has exercised this due diligence, then, for loss resulting from faults or errors in the navigation or in the management of said vessel, etc., he shall not be liable. The effect of the language employed under the constructions of the court is that the carrier is still held to the warranty of seaworthiness and that the exemptions only relate to matters which arise after ground has been broken for the voyage, and only apply then providing she was in fact seaworthy when the voyage began.

In the Silvia, 171 U. S. 462, where the glass cover of a port hole was closed and the iron cover was left open in order to light the compartment, and the vessel on the day after sailing encountered rough weather and the glass cover of the port became broken (cause unknown) and the cargo was damaged, it was held that the vessel was seaworthy and the carrier was excused from liability. In that case the hatches were battened down, but could have been taken off in a couple of minutes, and no cargo was stowed so as to prevent access to the port if it became necessary to close the iron cover.

In the International Navigation Co. vs. Farr & Bailey, decided April 22, 1901, the circumstances were very similar, except that neither glass or iron cover was closed, and an opening was thus left 2 or 3 ft. above the water line. The contention was made in behalf of the carrier that he was exempt from the liability because the failure to close the port was not his fault but that of his agent. The court held that such view could not be accepted; that the obligation to exercise due diligence extends to the owners, and all the owners' agents in the use of the equipment the owners have furnished, until the voyage is actually commenced. The court distinguishes this case from the Silvia in this: In the Silvia, the iron cover was intentionally left open for the purpose of lighting the compartment; in the present case it was an oversight; in the former case the failure to close was an error in management; in the present case it was unseaworthiness.

Another case is the Aggi, 107 Fed. 300, where the cargo was wet by water entering around some loosened bolts holding the scroll work under the ship's figure-head. The vessel had not leaked any on the previous voyage; she had encountered some heavy weather on this, but it appeared that these particular bolts had not been inspected for two years. The court held that the damage must be found to have been from unseaworthiness.

Again, the Catania, 107 Fed. 152, where a service pipe on the upper deck had a branch passing down through the deck and terminating in a cap for the attachment of hose for washing the amidship deck, but without any means of cutting off the water from the service pipe to this branch pipe. During the rolling of the vessel in severe cold weather the branch pipe froze and broke so that while they were using the main pipe on the voyage water ran through the branch pipe into the compartment and damaged the cargo. It was held that the vessel was unseaworthy, because of the break and because of loading cargo in a compartment with such branch pipe not suitably protected against frost.

REPORT OF ISTHMIAN CANAL COMMISSION.

It is the opinion in Washington that the report of the Isthmian Canal Commission which is in course of preparation, will not differ from the preliminary report, dated Nov. 30, 1900, so far as it relates to the selection of a canal route from an engineering standpoint, but in view of political considerations involved the commission will leave it to the United States government to determine whether international politics or engineering should have the most weight in reaching a conclusion as to the route to be selected. This transfer of responsibility for the selection of the route is due to the new attitude of the Panama Canal Co. and the Colombian government. A better understanding of the position that will be taken by the commission can be had from a brief statement of its conclusions set forth in the preliminary report.

The commission, in that report, pointed out that the Panama canal would be shorter and have fewer locks and less curvature than the Nicaragua canal; but, on the other hand, distances from ports on the Atlantic coast of the United States to ports on the Pacific coast were shorter by the Nicaragua route than by the Panama route. "The time required to pass over these distances being greater than the difference in time of transit through the canals, the Nicaragua line after completion," says the commission, "would be somewhat the advantageous of the two to the United States, notwithstanding the greater cost of maintaining the longer canal." The commission then pointed out that the Colombian government was not free to grant the necessary rights to the United States, except upon condition that an agreement be reached with the new Panama Canal Co., and added: "The commission believes that such agreement is impracticable." It then notes that the Panama company was then not willing to sell its franchise, but would allow the United States to become the owner of part of its stock. The commission considers such an agreement "inadmissible." After referring to the freedom of the governments of Nicaragua and Costa Rica to grant privileges to the United States, the commission gives this as its conclusion:

"In view of all the facts, and particularly in view of all the difficulties of obtaining the necessary rights, privileges and franchises on the Panama route, and assuming that Nicaragua and Costa Rica recognize the value of the canal to themselves and are prepared to grant concessions which are reasonable and acceptable to the United States, the commission is of the opinion that 'the most practicable and feasible route for' (quoting the words of the resolution of congress appointing the commission) an isthmian canal to be 'under the control, management and ownership of the United States,' is that known as the Nicaragua route."

It is therefore apparent that the commission has not changed its previously expressed opinion that "the Nicaragua line, after completion, would be somewhat the more advantageous of the two to the United States," but regarding the matter as of quite as much political as engineering and commercial importance will call the attention of the government to the willingness of the Panama Canal Co. and Colombia to make an arrangement with this country concerning the Panama route and point out that this new feature involves additional political consideration. It is understood that by political consideration the commission means the character of the arrangement that can be made with the republics concerned for permitting the United States to control a canal through their territory. The commission, it is said, has in view the advantage that will be given to the United States by the desire of Colombia, on the one hand, and Nicaragua and Costa Rica on the other, to secure the canal, and its recommendation will leave this government free to select the route, which, on account of concessions from Colombia or Nicaragua and Costa Rica, will be more fully under American political control.

LAKE FREIGHT MATTERS.

In view of the delays attending the opening of lake navigation this year, representatives of the large iron ore interests concluded this week that they had better be on the safe side of the freight market and engaged more vessels, practically all they could secure, for service throughout the season on a freight basis of 80 cents from the head of Lake Superior. It was certainly not expected before the season opened that this rate would be paid so freely, but the strike of engineers and the ice blockade in the St. Clair river did for the so-called independent vessel owners what they could not do by agreement for themselves—kept their ships in port long enough to greatly curtail the movement of freight. Probably after all the ore shippers will profit by their present action in making contracts on the 80-cent basis, as there are many large ore-carrying vessels that have not as yet moved a single cargo, and it is more than probable now that the estimate of 1,500,000 of ore to be shipped by June 1 will be cut down to less than 1,000,000 tons, as against about 3,500,000 tons moved to June 1 a year ago. The shippers of soft coal, who have far more coal to go forward than in any year within the history of lake navigation, are still refusing to make contracts for the season at 40 cents, which is the rate asked by vessel men to both Lake Superior and Lake Michigan ports. Some coal for the head of Lake Superior—less than 500,000—has been covered by contract at 35 cents, but the shippers have not secured anything like the capacity they desire at that figure. On one small block of coal for Milwaukee 40 cents has been paid, and arrangements have been made for the shipment of quite a large amount to Manitowoc and Sheboygan on a differential basis that gives those ports some advantage over the going rate to Milwaukee. In the meantime all wild charters for ore are being made from day to day on the 80-cent head-of-the-lake basis and 40 cents is paid to all leading ports on coal, both Lake Michigan and Lake Superior.

A series of articles on the "Mechanical Equipment of the Ship Yard," by Prof. J. H. Biles, designer of ships and now principal of naval architecture in Glasgow University, is begun in the May number of the Engineering Magazine. This first article is devoted almost entirely to illustrating and describing different types of ship yard tools. Prof. Biles says at the outset: "In these days of keen competition, not only at home but with foreign countries, the necessity of keeping abreast of the times in the matter of equipment is too evident to be dwelt upon at any length. Other conditions being the same, the cost of production will vary directly with the efficiency of the mechanical equipment; and modern improved tools capable of doing more work in a given time and often at less cost than the older types, together with labor-saving devices, or the substitution of mechanical for hand labor wherever possible, are essentials which will sooner or later determine the success or otherwise of an establishment such as a ship yard. The argument is sometimes heard in favor of old and obsolete tools, to the effect that they may have worked steadily for the last twenty years, and perhaps in their time have done good work, too, is scarcely a reason for their continued use; in fact, in many cases it is a potent argument in favor of the speedy substitution of newer and improved types. Recently, in America, new ship building companies have been formed, which, unhampered by many old traditions, but nevertheless availing themselves of the benefit of accumulated years of experience from many countries, will have exceptional opportunities for adopting the latest and most efficient appliances for handling and working materials, and in the course of a few years will, without doubt, form powerful rivals to the old country."

Japan is said to have practically given up the idea of building turbine destroyers, on account of their excessive consumption of coal at all speeds, and will instead build two destroyers of 356 tons and 7,000 H.P. of a type a trifle stronger than those already built by Thornycroft. An explosive of Japanese invention has been adopted for all guns of 203 mms. pattern.

INSTRUMENT FOR LOCATING SOUND.

Topophone is the name given to an instrument illustrated herewith and which is capable of locating a sound, the source of which may be at such a distance off as to render it inaudible to the unassisted ear. The instrument is the invention of Lieut.-Col. D. P. Heap, engineer of the third light-house district, Tompkinsville, N. Y. It is being sold by the J. B. Colt Co., room 7, No. 21 Barclay street, New York. Fogs, as we are all aware, are unquestionably the greatest menace to the mariner, and various attempts have been made, especially in recent years, to invent devices which will assist the navigator to locate his position in a fog. When a sailor can see a danger he has a chance to avoid it, but in a fog all he knows positively is the direction of his vessel as given him by the compass; as to the direction of warning sound signals, he has to depend solely on his unaided hearing, and the sense of hearing, so far as direction is concerned, is notoriously uncertain. And it is not by any means improbable that it is also the imagination which frequently deceives the mariner. He knows, or thinks he knows, that a certain fog signal should be heard in a certain direction; he is listening for it, and when he hears it his pre-conceived opinion biases his judgment.

The instrument consists of two acoustic receivers or trumpets pointing in opposite directions and supported on a vertical shaft. From the lower ends of the trumpets extend rubber tubes connected with the ears by specially constructed ear pieces. The observer holds the shaft so that the instrument is above his head; if a sound is heard in either ear—the right ear, for example—it shows at once that the sound must be somewhere on his right hand side. If he then turns to the right until the sound is heard in his left ear, it shows that he has passed the direction of the sound. If he then oscillates the trumpets so that the sound is heard alternately in each ear, the sound will be in a direction inside the angle of oscillation; this angle generally is about one point of the compass. The whole operation is simple, and the above operations take but a few seconds. As soon as the direction of the sound is ascertained, the observer can keep the topophone pointed in its direction, and, knowing the speed of the vessel and its course, the location of the sound can be quickly plotted accurately enough for all practical purposes. For example: Suppose the observer locates the direction of the fog signal at Beaver Tail, at first as due north—see the diagram showing use of the topophone (A)—that the vessel's course is N. E. ¼ E., and that after the vessel has gone one and a half miles the direction of the signal is west, by a very simple calculation it will be known that when the vessel was at A it was about one mile, and when at B about one and one-eighth miles from the fog-signal. If the directions of the fog-signals at Beaver Tail and at Brenton Reef light-vessel are determined by the topophone, the location of the vessel can at once be plotted.

The action of the instrument is, of course, due to the well-known law of interference of sound. When the two resonators face the direction whence the sound proceeds, so as to receive simultaneously the same sonorous impulse, and are joined by tubes of equal length, the sound waves received from them will reinforce each other, and the sound will be augmented. When, on the contrary, the resonators being in the same position as regards the source of sound, the tubes differ in length by half the wave length of the sound, the impulse from one neutralizes that from the other, and the sound is obliterated. Thus in determining the direction of the source of any sound with this instrument, the observer, guided by the varying intensity of the sound transmitted by the resonators, turns until their openings touch the same sound waves simultaneously, which position he recognizes either by the great augmentation of the sound, given that the tube lengths are equal, or by the cessation of sound, when the tubes vary so that the interference of the sound waves is perfect. It is obvious that the two methods (either may be performed almost instantaneously) may be used as checks upon each other, thus affording an additional factor of safety in the use of the instrument.

EXPORTS OF MANUFACTURES ALL OVER THE WORLD.

The rapid growth in the exportation of manufactures from the United States is explained in part by some recent studies of the treasury bureau of statistics regarding the proportion which the manufactures form of the imports of the great countries and grand divisions of the world. These calculations show in brief that but about 20 per cent. of the importations of Europe are manufactures; of Oceania, 40 per cent; of Asia, 47 per cent; of America, exclusive of the United States, 47 per cent., and of Africa, 61 per cent. When it is considered that the grand divisions in which manufactures form the largest per cent of imports are those in which the commerce of the United States shows the largest relative increase in exports, it is apparent that the growth in exports of manufactures is healthful and promises to be permanent. To Europe, whose imports of manufactures form but about 20 per cent. of the total importations, the exports from the United States increased 57 per cent. from 1893 to 1900; to Asia and Oceania, whose imports of manufactures form from 40 to 47 per cent. of the total importations, our exports increased 291 per cent. during the period named; and to Africa, of whose imports manufactures form 61 per cent., our exports increased 235 per cent. during the period under consideration. It is in all these markets where manufactures form the largest share of the imports that the European nations are struggling to increase their commerce. Africa, South America, Asia and Oceania are the fields of their greatest activity, and it is in those grand divisions—South America excepted—that the commerce of the United States shows a larger percentage of growth than elsewhere. Naturally the growth in our exports to Europe shows a larger sum in millions of dollars, by reason of the much greater consuming power of that grand division, but a very large proportion of our exports to Europe consists of natural products, chiefly foodstuffs, while manufactures constitute the bulk of our exportations to other parts of the world.

This disposition of the continents, countries and islands situated far from the United States, and possessed of limited facilities for even repairing machinery, to purchase costly and delicately adjusted machinery from the United States may be justly considered a tribute to the skill and faithfulness of the American workman. Such complicated and delicately-adjusted machines as clocks and watches, scientific instruments, sewing machines, typewriters, electrical machinery, shoe machinery, engines and locomotives are purchased with confidence and transported to countries and islands of the sea thousands of miles from the workshops and repair shops in which they were produced to be handled by comparatively unskilled operatives, and with a confidence that they may be relied upon to continuously and permanently perform the duties for which they are intended. In the last fiscal year we exported more than $125,000 worth of typewriting machines to Oceania; nearly $30,000 worth to Africa; $50,000 worth to Asia; $63,000 worth to Mexico; nearly $50,000 worth to the West Indies, and about $70,000 worth to South America. American printing presses were sent to Oceania in 1900 to the value of nearly $60,000; to Asia, nearly $40,000; and to South America, $16,000. The exports of American sewing machines in the fiscal year 1900 to the West Indies amounted to $130,000; to Asia, $54,000; to Africa, over $10,000; to Oceania, $531,000; and to Mexico, Central and South America, over $800,000.

MONTHLY SUMMARY OF NAVAL CONSTRUCTION.

The monthly summary of naval construction, issued by Rear Admiral Bowles, chief constructor of the navy, shows that excellent progress is being made upon the war vessels. The battleship Illinois is about completed and the submarines are well advanced. The new battleships and armored cruisers, for which contracts were lately let, have not as yet been laid down. Following is the summary:

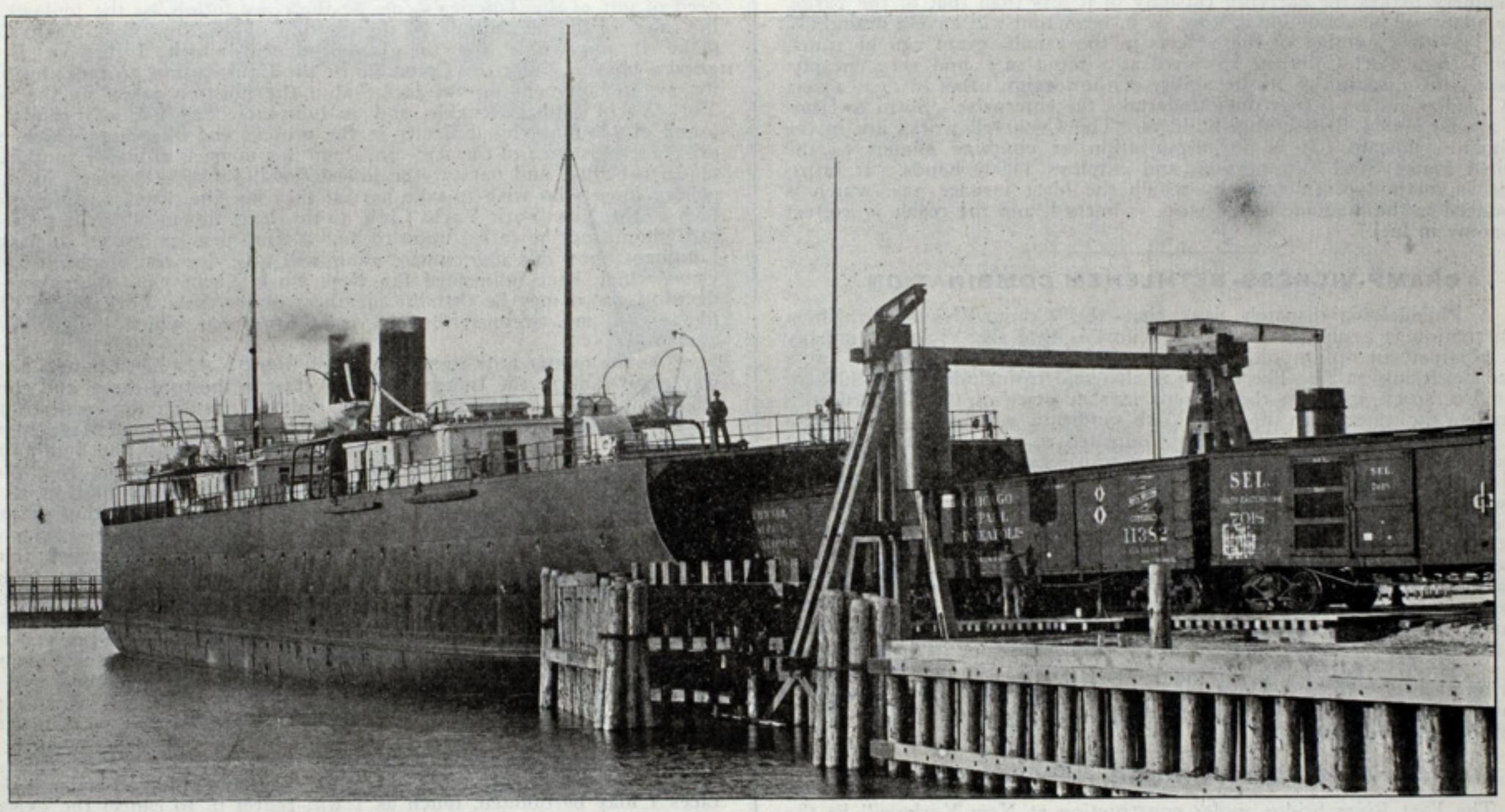
		Degree of completion, Per cent.	
		Apr. 1.	May 1.
BATTLESHIPS.			
Illinois	Newport News	90	92
Maine	Cramp & Sons	46	50
Missouri	Newport News	28	32
Ohio	Union Iron Works	39	42
Virginia	Newport News	0	0
Nebraska	Moran Bros. Co.	0	0
Georgia	Bath Iron Works	0	0
New Jersey	Fore River Co.	0	0
Rhode Island	Fore River Co.	0	0
ARMORED CRUISERS.			
Pennsylvania	Cramp & Sons	0	0
West Virginia	Newport News	0	0
California	Union Iron Works	0	0
Colorado	Cramp & Sons	0	0
Maryland	Newport News	0	0
South Dakota	Union Iron Works	0	0
SHEATHED PROTECTED CRUISERS.			
Denver	Neafie & Levy	43	45
Des Moines	Fore River Engine Co.	23	28
Chattanooga	Lewis Nixon	27	29
Galveston	Wm. R. Trigg Co.	17	22
Tacoma	Union Iron Works	17	18
Cleveland	Bath Iron Works	52	55
St. Louis	Neafie & Levy	0	0
Milwaukee	Union Iron Works		0
Charleston	Newport News	0	0
MONITORS.			
Arkansas	Newport News	49	54
Nevada	Bath Iron Works	84	86
Florida	Lewis Nixon	63	65
Wyoming	Union Iron Works	73	73
TORPEDO BOAT DESTROYERS.			
Bainbridge	Neafie & Levy	92	94
Barry	Neafie & Levy	88	88
Chauncey	Neafie & Levy	89	90
Dale	Wm. R. Trigg Co.	92	93
Decatur	Wm. R. Trigg Co.	92	95
Hopkins	Harlan & Hollingsworth	73	75
Hull	Harlan & Hollingsworth	71	74
Lawrence	Fore River Engine Co.	99	99
MacDonough	Fore River Engine Co.	98	98
Paul Jones	Union Iron Works	87	87
Perry	Union Iron Works	93	93
Preble	Union Iron Works	89	90
Stewart	Gas Engine & Power Co.	51	53
Truxton	Maryland Steel Co.	64	68
Whipple	Maryland Steel Co.	63	67
Worden	Maryland Steel Co.	63	67
TORPEDO BOATS.			
Stringham	Harlan & Hollingsworth	98	98
Goldsborough	Wolff & Zwicker	99	99
Bailey	Gas Engine & Power Co.	99	99
Bagley	Bath Iron Works	98	99
Barney	Bath Iron Works	99	99
Biddle	Bath Iron Works	98	98
Blakely	Geo. Lawley & Son	98	98
DeLong	Geo. Lawley & Son	98	98
Nicholson	Lewis Nixon	86	88
O'Brien	Lewis Nixon	90	90
Shubrick	Wm. R. Trigg Co.	97	99
Thornton	Wm. R. Trigg Co.	97	97
Tingey	Columbian Iron Works	68	68
Wilkes	Gas Engine & Power Co.	78	79
SUBMARINE TORPEDO BOATS.			
Plunger	Lewis Nixon	6	9
Adder	Lewis Nixon	40	50
Grampus	Union Iron Works	22	50
Moccasin	Lewis Nixon	28	40
Pike	Union Iron Works	18	50
Porpoise	Lewis Nixon	24	36
Shark	Lewis Nixon	22	35

It was expected some time ago that the large steel floating dry dock, building at the works of the Maryland Steel Co., Sparrow's Point, Md., for a government station at Algiers, near New Orleans, would be ready to be towed to its station next month, but it is now thought the dock will not leave Baltimore until some time in September. This work is the largest of its kind in the world. In towing it down the Atlantic coast and up the Gulf of Mexico several powerful tugs will very probably be required. The dock is 525 ft. long, 100 ft. wide and 28 ft. deep. It has a lifting capacity of 15,000 tons, which can be increased in an emergency to 18,000 tons. The cost of the dock was $810,000. The contract with the government calls for placing the dock in position at Algiers.

A SECOND PERE MARQUETTE CAR FERRY.

At the Globe works of the American Ship Building Co. in Cleveland on Saturday last the car ferry steamer Pere Marquette No. 17 was launched, and is so well advanced that it is expected she will be ready for service on Lake Michigan in connection with the Pere Marquette railway about the middle of July. The new vessel is practically a duplicate of the steamer Pere Marquette No. 15, shown in the accompanying illustration, which has been in service on Lake Michigan during three or four years past and which has already been very fully described in these columns. Some extra power in the vessel just launched is the main difference in the two ferries. The new vessel is also to have more cabin room on deck for passenger accommodations. Space is provided for thirty railway cars. Dimensions are: Length between perpendiculars, 331 ft.; length over all, 350 ft.; beam, 56 ft.; depth below main deck, 19½ ft.; depth from upper deck to floor, 36 ft. 13 in. Side channels are 12 by 3 in. and calculated to withstand a pressure of 25 lbs. to the square foot. The channels have 24 in. spacing amidship and 14 in. forward. Channel beams, which are thoroughly braced vertically and horizontally, span the hull at close intervals midway between the floor and main deck, to resist the crushing pressure of ice shoves during the severe winters. The hull has six water-tight bulkheads, dividing it into seven water-tight compartments for safety in case of collision. If any two of the compartments should fill with water the steamer would still be able to carry its load. The forward plating is ¾ in. thick and double for a distance of 60 ft. back of the stem. The plating is also doubled on the between-deck beam strake. The keelsons are close and extra heavy, and in the forward compartments they are almost solid. About 2,700 tons of plates and angles are used in the construction of such a hull. Insurance agents and representatives of other ship building concerns who have seen the Pere Marquette under construction unite in saying that the workmanship has been of a very excellent and thorough kind all through.

Twin screws are operated by two compound engines having cylinders of 27 and 56 in. diameter with 36 in. stroke. The screws are 11 ft. in diameter. Steam will be furnished by four boilers, each 13 ft. 3 in. in diameter and 12 ft. long, and allowed a working pressure of 130 lbs. to the square inch. There is, of course, the usual modern outfit of steam windlass, steam capstans, steam steering gear, etc., and an electric light plant with search light.



CAR FERRY PERE MARQUETTE—DUPLICATE OF THIS VESSEL HAS JUST BEEN LAUNCHED IN CLEVELAND.

REMOVING A 13-IN. GUN.

Naval Constructor Capps, in charge of the Brooklyn navy yard, is being generally congratulated upon success in removing a disabled 13-in. gun from the main turret of the battleship Kearsarge without removing the superposed turret. Naval experts said the turret would have to be removed. The cost was estimated at $40,000. Naval Constructor Capps thought otherwise, and as a result of a report to the navy department was authorized to do the job in his own way. Two of the large steel plates were removed from the sides of the main turret and the electrical firing apparatus was taken out. Hydraulic jacks were placed behind the gun, and a set of oaken ways was built from the turret to the shore. The ways were greased, and on them were placed saddles on which the gun was to rest. The gun weighs 70 tons and is 40 ft. long. The aperture through which it had to pass is only ¼ in. greater in diameter than is the gun. This gave only ⅛ in. leeway all around. When everything was ready, a few days ago, and the hydraulic jacks began to push on the gun, it gave no signs of moving at first, but soon began to slide down the ways. It was clear of the turret in less than five hours. The work cost about $10,000 and the government saved about $30,000 by the operation. A new 13-in. gun now in the Brooklyn yard will be lifted by derrick and placed in the turret.

DREDGES BUILDING IN CANADA.

Toronto, Ont., May 21.—The Polson Iron Works of this place is building for the Canadian government a dredge of 126 ft. length that is to cost about $100,000 and will begin work shortly, it is understood, on a still larger dredge (160 ft. length) for work on the St. Lawrence ship canals. Both dredges are of the self-propelling kind, designed by Mr. A. W. Robinson, who has been commissioned by the government to look after important public works, and who has had a great deal of experience in the building of dredges and in other branches of hydraulic engineering. The dredge under construction is to be used in the improvement of the Fraser river and the Pacific coast ports of British Columbia. The rapid advancement of the province has made it necessary to deepen its harbors and channels, so that ships of large capacity can navigate with safety; and after long and careful study of the question, it was decided to build a powerful dredge of special type, which, although primarily intended for the Fraser river, can steam itself to any other point in the vicinity and do a great variety of work. The dredge has a capacity of 1,000 tons per hour, dredged and delivered at a distance of 4,000 ft. This is accomplished by an immense centrifugal pump about 11 in. in diameter, having a steel suction pipe, which can be lowered to a depth of 40 ft. At the end of the suction pipe is a powerful rotary excavator of steel, which can cut or disentegrate any material short of rock or large boulders. This material is then sucked up by the pump with sufficient water to carry it along at the rate of 15 ft. per second, and discharged through a pipe. The dredge is arranged so that it can discharge in any desired way, either into scows, or over an embankment, or to a long distance through a flexibly connected floating pipe.

The boilers and engines are of 1,000 H.P. The engines are of the triple expansion surface-condensing type, with water tube boilers capable of carrying 225 lbs. working pressure. The dredge is fully equipped for either fresh or salt water service, with complete appliances of the latest pattern. The hull has a steel frame throughout, and will be shipped from Toronto in sections, and put together in British Columbia, where it will be sheathed with wood. The main deck of the dredge is entirely devoted to machinery, while the upper deck contains accommodation for the officers and crew. Here are several staterooms, separate mess rooms for the officers and crew, kitchen, pantry, bath room, etc. The dredge is fitted with electric light, and has a complete machine shop for making ordinary repairs while in remote places. The dredge is also a complete self-propelling steamboat, with pilot house and steering gear, so that when her work is completed at one locality she can pick up her anchor and go to another. The Polson Iron Works is building the dredge complete—all machinery as well as the hull.

It is reported from England that the admiralty will lay down in 1901 three battleships of 18,000 tons each, which will be the largest and most powerful vessels of their class ever built. Each will carry four 50-ton 12-in. guns, and ten instead of twelve 6-in. rapid-fire guns. The reduction in the number of 6-in. guns is due to the introduction of an entirely new weapon, namely, the 7.5-in. wire-bound breechloader, which is adopted because 8-in. guns are too heavy for rapid work and something is needed between the 12 and 6-in. guns. Each ship will cost fully £1,250,000. London newspapers cite Capt. Mahan and other naval authorities in favor of big ships, and predict that battleships will soon reach a displacement of from 20,000 to 30,000 tons.

On her trial a few days ago the torpedo boat Bagley established a record for the 28-knot boats by attaining a speed slightly in excess of 30 knots, and maintaining an average for 2 hours of 29.2 knots. She was built at the Bath Iron Works, Bath, Me.

TO DEVELOP ST. LAWRENCE COMMERCE.

A report from Ottawa regarding new interests that are said to be connected with the plans for diverting the export commerce of the lakes down the St. Lawrence to Montreal is given here for what it is worth. The dispatch follows:

"Hon. J. Israel Tarte, minister of public works, intimates that important developments are on foot in regard to the transportation problem. The minister says that in addition to the employment of grain carriers of the largest size on the upper lakes, a fleet of steel barges, each costing $100,000, would soon be placed on the route between Port Colborne and Montreal. 'About these matters I am unable to speak at present,' Mr. Tarte said, 'but something definite will be evolved.' Closely following the minister's statements comes the important announcement of C. F. Desola, the Canadian representative of the Cockerell works, Belgium, and of Swan & Hunter, ship builders and ship owners, of Tyneside, England, who says that his companies are planning to put a big fleet of grain carriers on the Canadian canals as soon as the two primary projects become definite undertakings. These projects are the equipping of Montreal with an elevator system and the fitting of Port Colborne for the handling of grain. The Montreal project has already been made a reality, as the Dominion government has decided to loan the Montreal harbor commissioners $1,000,000 to carry it into effect. The government also intends to at once thoroughly equip Port Colborne, and has asked parliament to grant an appropriation of $470,000 for that purpose, so that both the required projects are now assured.

"Designs for the boats and barges have already been decided upon. It is intended to build steamers and barges, in the proportion of one to two. Two barges will be towed by each steamer or propeller. Their dimensions will be the same, but the space in the steamer occupied by machinery makes the carrying capacity of it less than that of the barge. The boats will be about 160 ft. long, 42 ft. beam and will have a draught of 14 ft. With a number of these fleets in the canals, grain can be transported from Port Colborne eastward at a rapid rate, and very cheaply. There is no question as to the ability of the foreign firms to float a fleet in Canadian waters if they once undertake the enterprise. Swan & Hunter are far-famed British ship builders. The Cockerell works are in the Belgian syndicate. It is an organization or combine similar to the United States Steel Corporation, and employs 14,000 hands. It introduced a method of smelting by which the blast furnace gas, which is produced in the manufacture of steel, is burned, and the result is a great economy in fuel."

CRAMP-VICKERS-BETHLEHEM COMBINATION.

A Philadelphia dispatch says that the Cramp-Vickers-Bethlehem combination is assured. The latest report is that the Vickers company has obtained an option on the stock of the Bethlehem Steel Co. at a price bordering on 23. The option is also said to include the Bethlehem Iron Co. stock at about the present market price of 63. In order to complete the transaction the New York syndicate, which is to underwrite the present combination, has been compelled to raise about $15,000,000 in actual cash, as it is entirely a money transaction, and fully that much will be required to purchase the stock of the two Bethlehem companies. It will take $7,000,000 to buy the Bethlehem Steel stock. Negotiations have been on for several weeks, and it has been within the last few days that satisfactory arrangements were made with the Bethlehem interests. One block, representing 80,000 shares of stock, was in charge of two prominent Philadelphia financiers, whose agreement to a price a few days ago is said to have perfected the arrangement. Stockholders of the Cramp company will have the option of taking cash, or exchanging their holdings, share for share, for a 7 per cent. preferred stock in the new company. There is $5,000,000 worth of Cramp stock, and $15,000,000 cash will be necessary to buy out Bethlehem. Enough stock will be sold to provide at least $5,000,000 working capital, and the new bond issue will likely not exceed $5,000,000.

EAST RIVER BRIDGE, NEW YORK.

The East River bridge under construction at New York will be the largest suspension bridge in the world. The old Brooklyn bridge is its nearest rival. The comparative dimensions of the new bridge with the Brooklyn bridge will give graphically the size of the completed East River structure:

	EAST RIVER.	BROOKLYN.
Strength in proportion	4	1
Width	118 ft.	85 ft.
Total length of span	7,200 ft.	6,000 ft.
Channel span	1,600 ft.	1,595½ ft.
Height of towers from water	335 ft.	276 ft.
Minimum length at center	135 ft.	135 ft.

Trouble is expected in the navy department over the completion of the big stone dry dock at the Mare island navy yard. The Atlantic, Pacific & Gulf Co., which had the original contract for building a timber dock at that place, has refused to agree to the adjustment of cost determined by a board of naval officers and recommended by Rear Admiral M. T. Endicott, chief of the bureau of yards and docks. The same firm has the contract for building a similar dock at League island, and agreed to complete that work. The refusal to go on with the contract at Mare island is somewhat embarrassing to the government and will, of course, delay the work on the dock until another call for bids can be made and a new contract awarded. The retiring firm will receive about $200,000 for the work so far completed, and the navy department will have at its disposal for the new contract about $975,000. The law officers of the navy department must now wrestle with the problem of closing out the old contract and paying off the dissatisfied contractors.

Rear Admiral Geo. W. Melville has been engineer-in-chief of the navy for fourteen years—since August 9 1887. In that period there have been constructed, or there are now building, for the navy, 138 vessels of all types, with an aggregate horse power of 948,728 and a total displacement of 481,028 tons. Scarcely a vessel in this fleet carries in any form a pound of foreign metal. They are American ships from keel to fighting tops.

THE INDEPENDENCE AND THE CUP RACES.

Thomas W. Lawson of Boston, owner of the yacht Independence (so-called Boston cup defender), which was launched on Saturday last, has made a statement regarding correspondence with the New York Yacht Club on the subject of his boat participating in the America's cup races. Mr. Lawson says:

"For a number of weeks there has been correspondence between the New York Yacht Club and myself on the subject of the Independence being allowed to take part in the cup defence. This correspondence started with a courteous letter from the club informing me that the cup racing committee believed they were expressing the unanimous sentiment of the New York Yacht Club in saying that the appearance of the Independence as a competitor for the honor of defending the cup would be very heartily welcomed. From start to finish the New York Yacht Club has expressed a desire to be fair and just, but has been unchangeably firm in its position that by either the deed of gift, the constitution and by-laws or the rules, regulations and customs of the club the Independence could take no part in the trial or cup races unless I gave up my ownership of her to a member of the club. I conceded that the New York Yacht Club should have absolute management and control of my boat; that she should sail under the club's rules and regulations; that while in such absolute management and control the club might fly its own flag or any flag it might choose over the Independence, and I agreed to bind myself to do all of these things they requested that were possible for an owner to do, but of course I was as unchangeably firm in my position that I would under no circumstances give to any individual that which in every way belongs solely to me.

"It is not for me to criticize the position taken by the New York Yacht Club, nor have I any desire to do so. I can only regret that the deed of gift of the America's cup, or the constitution, or the by-laws, or the rules, or the regulations for the customs of the New York Yacht Club make it impossible for the Independence, which I believe is as good a boat as either the Columbia or the Constitution, to race; but it is for me to comment on the fact that if the position taken by the New York Yacht Club is tenable, and an honorable and fair way cannot be found of avoiding this difficulty in the present and like cases which may arise, the existence of the America's cup is a menace to manly sport, as it tends to belittle and narrow the international yachting contests by compelling those who wish to take part, if they be Americans and not members of the New York Yacht Club, to do those things which fair sportsmen should not be called upon to do. I trust that sportsmen in passing judgment upon this unfortunate affair will give due consideration to the views which have influenced the New York Yacht Club in making its decision, for it may be that the members of the New York Yacht Club, like myself are circumscribed by conditions over which they have no control.

"As the matter now stands, the New York Yacht Club cannot see its way clear to allow the Independence to start in the trial races, and consequently the races for the cup defence, unless I transfer my ownership of the Independence to some other individual, which I will under no circumstances do, although I will freely and absolutely intrust the boat to the New York Yacht Club, or to any committee or official the New York Yacht Club may decide upon, in any way that the club may desire. I would say to the many friends of the Independence that if within the next week or so I definitely determine that the Independence cannot have any opportunity in the cup races, I will ask the owner of Shamrock I. and Shamrock II. and the owners of the Columbia and Constitution to give the Independence a race after the America's cup match has been decided, and will agree to any terms or conditions, time or place, which any recognized American yacht club will decide to be fair, and as such a race will not be confined to existing conditions, I trust no insurmountable obstacle will prevent its consummation. If the Shamrock's owner and the owners of the Constitution or Columbia will, on or before July 2, agree to such a race, I will at every opportunity between the time of such agreement and the time of that race allow the Independence to meet any or all of the four boats in formal or informal races, that she may receive the necessary practice and tuning up; but if it is impossible to arrange these races I may be obliged, much as I will regret it to cancel the existing engagement of the Independence to race the Columbia and Constitution at Newport on July 2, 4 and 6, because it would be manifestly unfair to hang the fate of the Independence on this one race, which occurs at such an early date as to give her no reasonable opportunity to get in trim. When I accepted this race it was understood that it was more a tuning-up opportunity than a decisive test of the relative merits of the boats.

"If it cannot be definitely decided within a few days that the Independence has something to live for I will allow her merits to remain untested and do all in my power to obliterate any evil effects that may have come to the grand sport of yachting through anything connected with this unfortunate episode."

By the purchase of the Ashland mine lease, the Cleveland-Cliffs Iron Co. has certainly strengthened its position as the one large producer of Lake Superior ores apart from the United States Steel Corporation. The transfer is from the Hayes Mining Co. By the terms of the lease the Cleveland-Cliffs company agrees to operate the Ashland mine during the life of the lease of the Hayes company, which expires in 1919. The new operators agree to mine a minimum output of 200,000 tons yearly. The sub-lease provides for the payment of 50 cents a ton royalty to the Hayes Mining Co. There has been sold for delivery in the coming year 250,000 tons of Ashland ore and the mine will be worked for an output of about 400,000 tons in the year. It is good for 400,000 to 500,000 tons of first-class Bessemer ore a year, for many years. In the past two years the property has been put in excellent shape and a large ore body prepared for extensive and economical operation.

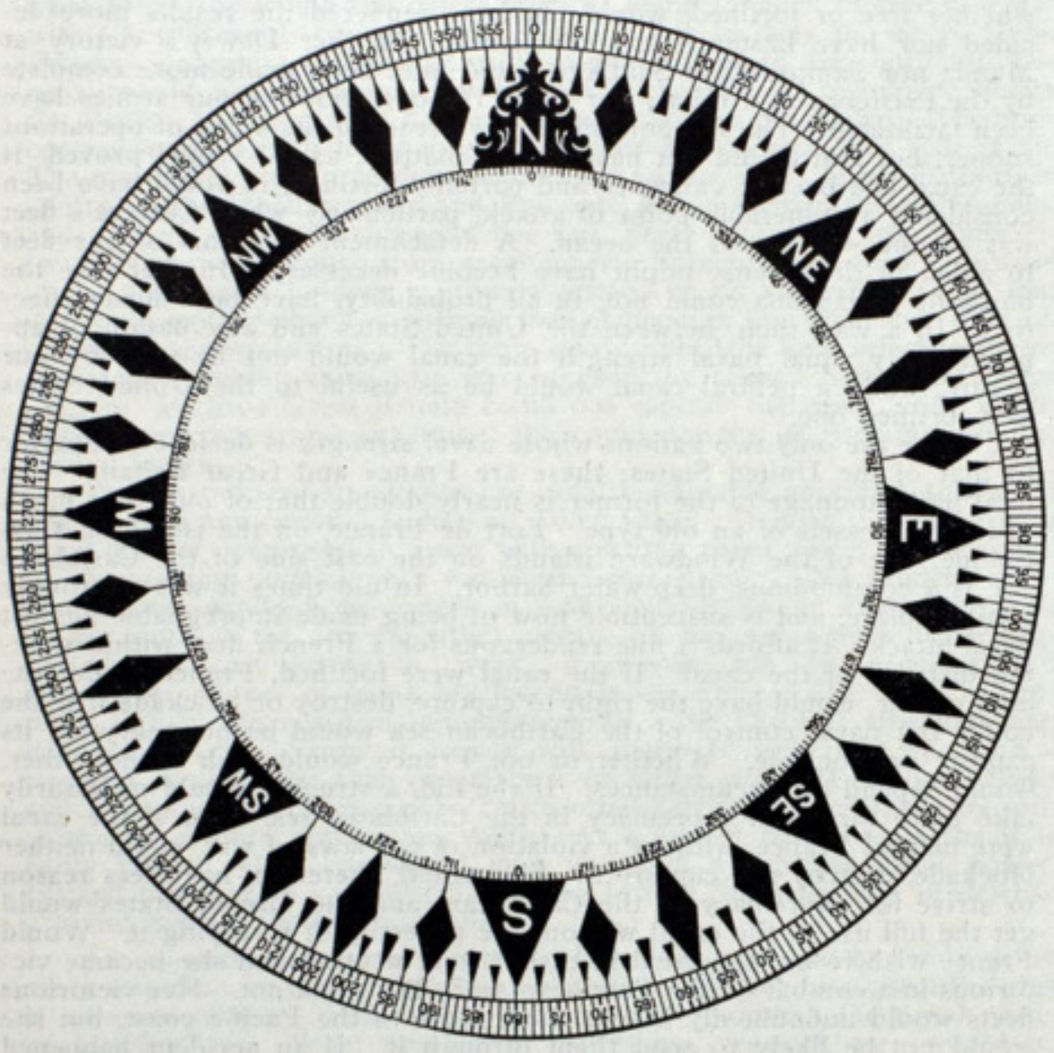
Chairman Theodore E. Burton of the rivers and harbors committee, as well as nearly all the members of the committee, will visit California early in the coming month for the purpose of investigating the government works under way in that state. It is the intention of the committee to spend twenty days inspecting the rivers and harbors of California. They will go to Southern California first and then spend about a week in and around San Francisco. Stockton, Sacramento and Marysville will be visited and trips made on the San Joaquin and Sacramento rivers.

ANOTHER FORM OF COMPASS CARD.

PROPOSED TO EMBODY BOTH THE DEGREE SYSTEM AND THE POINT SYSTEM IN ONE CARD WITH A VIEW TO BRINGING ABOUT GRADUALLY THE ADOPTION OF THE FORMER.

A second proposed compass card comes from the hydroghaphic office of the navy and is submitted to navigators for comment. It differs from the former card in that both the old and the new methods are used, points as well as degrees. It is probably the opinion of the hydrographic office officials that a radical change from the point system to degrees would come about very slowly, no matter what the merits of the latter might be, while with the use of both systems on the card the adoption of the degrees instead of the points would come about gradually. The hydrographic office will, of course, be pleased to give attention to suggestions or discussion of any kind regarding this card from the men aboard the vessels. It will probably be well to repeat what has already been said regarding the first card, which contained only the graduated circle of degrees and which was worked out by Lieut. Com'dr S. W. B. Diehl of the compass office of the navy. The chief of the navy bureau of equipment said of it:

"For some years this matter of doing away with the compass points and substituting degree graduations has been discussed among navigators, and the consensus of opinion, certainly among the higher order of navi-



PROPOSED FORM OF COMPASS CARD.

gators, is that the points should be abolished and only degrees used in setting courses, taking bearings, and in notices to mariners. A number of years ago a graduation of the compass rose from zero to 360 continuously by the right was proposed. Opposition arose from the naval examining board, and before the Maritime Congress then in session in Washington; the conclusion reached was that the time was not yet ripe for doing away with the old-fashioned compass points on the compass cards. There can be no question that in the last fifteen or twenty years the general standard of navigators has risen so that the present is deemed an appropriate time to take this step in advance, and while it is recognized that some opposition may be expected from the least-educated class of masters of vessels, it is believed that the greater maritime nations will recognize the advantage and adopt the same general method. The simplicity, as set forth in the memorandum from Lieut. Com'dr Diehl of the compass office, will doubtless have great weight even with the uneducated class of navigators, and once adopted it will greatly simplify many of the navigating operations of today and conduce to accuracy, which enters so largely into the handling of the larger ships that are increasing so rapidly in all parts of the world. It is therefore recommended that there be distributed at the more important mercantile centers of our own coasts and at branch hydrographic offices copies of these proposed changes, and that requests of intelligent mariners be made as to the advisability of their adoption. As Lieut. Com'dr Diehl well says, criticism should be invited. It is further recommended that these drawings, or copies thereof, be submitted to the leading hydrographers of other nations and an expression of opinion invited from them. It is believed that the necessary information to guide the bureau will have been received before the beginning of next year, so that should the final conclusion be reached to adopt it in this hydrographic office, the necessary compass cards can be distributed to ships now in service and be obtained by others desiring to use them. Already there has been obtained from the branch hydrographic offices much information which can be submitted to the bureau bearing upon this subject, and in general it may be stated, as previously, that the better navigators of today are in favor of the proposed change."

Lieut. Com'dr Diehl's memorandum explanatory of the proposed changes is as follows:

The circumference of the card is divided into the usual 360 degrees and marked continuously to the right, from 0° at north to 90° at east, 180° at south, 270° at west, and 360° at north. The card is subdivided as follows:

(a) Into divisions of 10 degrees, accentuated by heavy lines on the graduated rim, and by suitable geometric figures on the card, each 10-degree division of the card being indicated in figures by its appropriate number from 0° or north.

(b) Each 10-degree division of the card is further subdivided into half and quarter divisions and appropriately marked.

(c) Every fifth-degree line of the graduated circle between the 10-degree divisions is marked in figures, indicating its appropriate number from 0° or north.

(d) The cardinal and intercardinal directions are emphasized on the card in geometric figures.

The object of the proposed change is to omit the present system of points and fractions thereof and use degrees only. The present card contains points and degrees. The conversion of one into the other is a natural result of the presence of both, but is not a necessity, as would speedily be recognized were the points omitted. Accuracy requires expression in degrees for courses, bearings, and compass errors, and not in points, the use of which is but a duplication of work. A comparison of a few leading features of the present system with that proposed is given below:

PRESENT CARD.	PROPOSED CARD.
360°=32 points.	360°=36 divisions.
1 point=11.25°.	1 division=10°.
½ point= 5.625°.	½ division= 5°.
¼ point= 2.8125°.	¼ division= 2.5°.
Graduated circle is marked in degrees in each quadrant from 0° at north and south to 90° at east and west.	Graduated circle is marked in degrees continuously to the right from 0° at north to 360° at north again.
The fifth point is NE. by E. or N. 56° ¼ E.	The fifth division is 50°, a multiple of 10°.
The thirteenth point is SE. by S. or S. 33° ¾ E.	The thirteenth division is 130°, a multiple of 10°.
The course is S. 18° E. or S. by E. ⅝ E.	The course is 162°.
Easterly deviation is additive in the NE. and SW. quadrants; subtractive in the SE. and NW. quadrants, to compass course to get magnetic.	Easterly deviation is always additive to compass course to get magnetic.
Westerly deviation is subtractive in NE. and SW. quadrants; additive in SE. and NW. quadrants, to compass course to get magnetic.	Westerly deviation is always subtractive from compass course to get magnetic.

In line with the proposed card, the compass rose on the chart should be marked from 0° at north continuously to the right to 360°, omitting the present system of points. The sailing directions should give courses and bearings in degrees and not in points. The azimuth tables would require only a change in the rules given at the bottom of the page, as follows:

When the latitude and declination are of the same or contrary name—

In north latitude the azimuth is the tabulated value when the time is a. m.

In north latitude the azimuth is 360° minus the tabulated value when the time is p. m.

In south latitude the azimuth is 180° minus the tabulated value when the time is a. m.

In south latitude the azimuth is 180° plus the tabulated value when the time is p. m.

No other change in the tables would be necessary. Such tables as that on page 8 of Bowditch, and tables 1 and 5A would be eliminated.

It is believed that the proposed marking of the compass card would result in greater accuracy in navigation in its relation to the compass. Courses would be laid in degrees and more accurately noted, as the approximate course of SW. by W. ¼ W. "a little westerly," for example, would be replaced by the exact course of 240°. Chances of error in the application of the deviation to compass courses would be lessened. Conversion of points into degrees and the reverse would be eliminated from the problem. Boxing the compass would be a matter of a few minutes' instruction to the layman of average intelligence. Sailing directions would be simplified. All work in relation to the compass would be facilitated.

A naval expert writing in the Scientific American of the two cup yachts, Shamrock and Constitution, says: "The models of the yachts, as far as can be judged from their above-water lines, are radically different. The beam of Shamrock, at least in the deck-plan, has been maintained to well abreast of the mast, while the boat begins to narrow in from slightly abaft the chain plates and is drawn out into a stern which certainly does not measure more than 6 ft. across the taffrail. It is evident that her freeboard has been reduced to something less than 4 ft. amidships, so that while Mr. Herreshoff has been increasing the height of his topsides, Mr. Watson has been going to the opposite extreme. What renders this more curious is the fact that, judging from her lines, the Watson boat will have less initial stability, and would, therefore, seem to require the deeper topsides to lie down upon. Another curious fact regarding the English cutter is that the sail-spread will evidently be much smaller than has been reported, and certainly smaller than that of the American boats. The value of the time-allowance thus gained will depend entirely upon the strength of the wind in which the races are sailed.

The Armstrong Bros. Tool Co., Chicago, has received two orders from the United States government, one for 60 assorted tool holders to be sent to the bureau of steam engineering at the Puget Sound naval station, Washington, and the other for 117 tool holders for the bureau of ordnance at the Washington (D. C.) navy yard.

AN ISTHMIAN CANAL FROM A MILITARY POINT OF VIEW.

COL. PETER C. HAINS, Corps of Engineers, U. S. A., in the Military Service Institution Journal.

Assuming that an isthmian canal will be built by the United States, the question arises how can it be made to subserve the best interests of the government from a military point of view. Should it be free to the vessels of all nations on the same terms, in war as well as in peace, or should it be controlled by military power, so that its use by our enemies in time of war could be prevented? It is not proposed to discuss the cost of putting the canal under military control, nor the ways and means of so doing. It will be assumed that it can be put under military control, or that it can be made free, at the pleasure of the United States. An isthmian canal cannot be built within much less than ten years. What the relative naval strength of the various powers will be at the end of that period it is impossible to tell. Moreover, it is not easy to assign the proper place to some of the naval powers today. One nation may be strong in defensive but relatively weak in offensive power. The number, size and power of battleships and cruisers may not furnish the correct data for assignment of place. Naval training and geographical position are important considerations. The submarine boat is an unknown factor. But judging by the official lists, the principal naval powers have not greatly altered their relative positions in the last ten years. The United States and Japan have forged ahead; Spain and Italy have fallen behind.

The eight strongest naval powers stand as follows: (1) Great Britain, (2) France, (3) Russia, (4) United States, (5) Germany, (6) Italy, (7) Japan, (8) Spain. Of these, Great Britain and France are decidedly stronger than the United States. Russia, the United States and Germany are approximately equal, and all others decidedly inferior to the United States. War may take place between the United States and any of the other named powers, or combinations of two or more, or it might be with one of those allied to some weak power not in that list. It is impossible to foretell all the combinations that might arise, but it is probable that if an alliance of any two or more powers should make war against us we also would have allies; so that in dealing with the question we shall consider only the cases of war between the United States and a single power.

Let us suppose a war exists between the United States and some nation of inferior naval power. What effect would the existence of the canal have on the operations of either belligerent? The nature of the operations of both would depend largely on the geographical position of that enemy, the more or less maritime character of the people, and the value of her commerce and colonial possessions. Our policy would be to attack her war vessels wherever they could be found, shut them up in harbors by blockade if they could not be reached, bombard naval stations, possibly invade her territory if the conditions favored and the probable results justified it. Japan, a young and vigorous naval power, occupies a favorable geographical position to operate against us in the far east, and is fairly well provided with modern cruisers for attacking our commerce in the Pacific. An attack on the Phillipines is within the limits of probability. If successful, Japan might even make a naval demonstration as far eastward as our Pacific coast, but it is difficult to understand how a condition of affairs could arise that would make it desirable for her to send a fleet through an American isthmian canal to the Atlantic side. Such an event could only happen in case our navy in the Pacific were destroyed and that on the Atlantic side perilously weak, a condition which it is safe to assume is not likely to arise in a war with Japan. As for the European nations that are inferior to us in naval power, none are capable of conducting important naval operations against us on either the Atlantic or Pacific sides of the United States, and none are provided with naval bases of supply in such proximity as to cause us any alarm. Some of them might send out cruisers to prey on our commerce, but they would not be sent through an American isthmian canal to do so.

Of the republics of South and Central America it may be said, first, that they do not possess sufficient naval strength to give us any concern, and, second, that their interests are so closely interwoven with ours that war between any of them and the United States is scarcely probable. But if it should occur, none of them would send their warships through an isthmian canal. The greatest danger would be in the canal being damaged by a few men, and this danger would be greater if the canal were fortified than if it were neutral. It is safe, therefore, to conclude that in a war between the United States and a nation of inferior naval power the canal would be of no value to our enemy, while a neutral canal would be as serviceable to the United States as one thoroughly fortified.

The nations that are approximately equal to the United States in naval strength are Russia, Germany and Italy. Measured by tonnage, the first of these has a navy of about 25 per cent. larger than that of the United States. But Russia is so situated geographically that operations against us could only be carried on at a disadvantage. She has a position at Vladivostock which is reported as being strongly fortified. It will soon have railroad connection with the capital of the empire, and will become an important base in the east. It lies uncomfortably close to the Philippine islands, which are far removed from the support of the United States. The harbor of Vladivostock, however, is impaired by climatic conditions. The cold is so intense that the harbor is closed by ice for several months in the year. To reach the Philippine islands and our commerce in the Pacific the Suez route for Russia is shorter, better and less liable to interruption than one via an American isthmian canal.

The geographical position of Italy is not good for conducting hostile operations against the United States. In tonnage she is below, but in number of war vessels she is above the United States. She has an immense fleet of torpedo boats, a comparatively small number of fast cruisers, and is far behind the United States in modern built ships. Some of her battleships a few years ago were regarded as the most formidable afloat, as they carried the largest guns in existence. But these ships are not well adapted to operating at a long distance from a base. It is difficult to see how Italy could do us much harm on the Atlantic side. A swift cruiser might capture some of our merchant vessels, but that Italy should contemplate sending a fleet through an American isthmian canal to the Pacific is preposterous. Should she make a naval demonstration in those waters it would be in the extreme western part, most probably in the vicinity of the Philippine islands, and for this purpose the Suez route is shorter, safer, and in every way better. Italy is more of a commercial nation than Russia, but her commerce does not amount to much, consisting chiefly of fishing vessels that never go far away from home. She has no important colonies. Those in Eastern Africa are not of sufficient importance to warrant the cost of an expedition for their capture, and their loss to Italy would not have an important influence on the war.

Germany and the United States are more nearly on an equality in naval strength than any other two important naval powers. In tonnage they are nearly equal; in modern built ships the United States is ahead. Germany has, however, a great number of torpedo boats, and many of her cruisers are what are known as unprotected. The naval program of Germany would make her the superior of France in fifteen years if the latter remain stationary. In other words, she would become in 1916 the second maritime power of the world, if her program be carried out and the navies of other nations do not advance. Germany, however, has no colonies or supply stations on the Atlantic side of the United States in close proximity to our shores. Her nearest colony is in Africa, too far removed to be of much use in a war with the United States, even if it were otherwise advantageous. On the Pacific side Germany has supply stations, but they are few and far from the shores of the United States; but to attack us on that side, Germany would not use an American isthmian canal. The Suez route is better and less liable to be interrupted.

In the late war, Spain and the United States were generally considered to be approximately equal in naval strength, yet an isthmian canal, whether free or fortified, would not have rendered the results more decided nor have hastened the conclusion. Neither Dewey's victory at Manila nor Sampson's at Santiago could have been made more complete by the existence of a canal; nor could the operations of our armies have been facilitated. The Oregon might have reached the scene of operations sooner, but that would not have helped matters, as the sequel proved. If the canal had been in existence and partially fortified, it would have been considered a vulnerable point of attack, particularly when Cervera's fleet was on the way across the ocean. A detachment of a part of our fleet to assist in the defense might have become necessary. In that case the blockade of Havana could not, in all probability, have been made effective. In a war, then, between the United States and any nation of approximately equal naval strength the canal would not be used by our enemy, while a neutral canal would be as useful to the United States as a fortified one.

There are only two nations whose naval strength is decidedly superior to that of the United States; these are France and Great Britain. The total naval tonnage of the former is nearly double that of ours, but much of it is in vessels of an old type. Fort de France, on the island of Martinique, one of the Windward islands on the east side of the Caribbean sea, is a commodious, deep-water harbor. In old times it was a strongly fortified place, and is susceptible now of being made impregnable against naval attack. It affords a fine rendezvous for a French fleet within striking distance of the canal. If the canal were fortified, France, under the laws of war, would have the right to capture, destroy or blockade it if she could, but naval control of the Caribbean sea would be necessary for its capture or blockade. Whether or not France would wish to do either, would depend on circumstances. If she did, a struggle would necessarily take place for naval supremacy in the Caribbean sea. But if the canal were neutral France, without a violation of the laws of war, could neither blockade, destroy nor capture it. She would, therefore, have less reason to strive for supremacy in the Caribbean, and the United States would get the full use of the canal without the necessity of fortifying it. Would France wish to use the canal in case it were neutral, and she became victorious in a combat on the Carribean sea? We think not. Her victorious fleets would undoubtedly have a short route to the Pacific coast, but she would not be likely to send them through it. If an accident happened to the canal while she depended on it as a part of her line of communication, her fleets would be placed in an awkward predicament. Moreover, there is better game on the eastern side more easily reached. On the other hand, if we became the victors in an engagement on the sea, the enemy's fleet would fall back on Martinique, or recross the Atlantic; but it is not probable that a beaten French fleet would try to escape through an isthmian canal westward, even if it were freely open. In operating against the Philippines, France would use the Suez canal.

Great Britain is by far the most formidable naval power in the world, whether measured by tonnage displacement, by number of ships, by weight of armor, or gun power. Her tonnage at the present time is nearly five times that of the United States, and more than double that of any two nations of the world combined. Her ships are of the latest types and the personnel of her fleet is in a high state of efficiency. Great Britain is a commercial nation, and dependent on the outside world for her subsistence. Her foremost object would be to keep open her avenues of trade, destroy everything that could threaten them, and render her adversary incapable of interfering with them. In a war with the United States her first aggressive operations would doubtless be on the Atlantic side, for which Great Britain is well provided with good bases in close proximity to our shore. Halifax is near our northern coast. Bermuda is only about 800 miles east from Charleston, while the Bahamas and Kingston are close to the southern coast. These stations form a cordon around our coast, which would menace the operations of our navy, and from which Great Britain could operate against our coastwise commerce at her leisure.

If the canal were fortified a garrison would be stationed there. To keep open communications between it and the United States would become a matter of the most vital concern. To destroy those communications would therefore be an object of the highest importance to Great Britain. She could afford to weaken herself temporarily at other points in order to accomplish this, and we would be compelled to concentrate the bulk of our navy in the Caribbean sea to maintain them. With five battleships to our one, and with Kingston, a deep, well fortified and commodious harbor, as a base of operations, Great Britain would have every chance in her favor. The Caribbean sea would thus at first become the chief theater of war on the Atlantic side, and the canal itself a military outpost, which could only be re-enforced by troops conveyed to it by water. Now, a navy to be efficient must have freedom of action. If it be fettered with the task of keeping open this line of communications in

the face of a powerful foe, its efficiency would be lowered if not destroyed. We could not depend on maintaining communication on the west side with our Pacific seaports. The line is too long and too easily broken. That Great Britain might eventually capture the canal is not beyond the range of possibility. The fact that it would be a most valuable prize, and its loss to the United States so detrimental to our interests as well as our prestige, would induce Great Britain to exert her utmost powers. If by any unfortunate circumstance adequate defenses or sufficient troops were not provided prior to the breaking out of war, the capture of the canal might become comparatively easy to a nation in control of the sea on each side.

An isthmian canal, to be of service to the United States, presupposes that passage to it, through it, and from it is assured. But passage to or from it in case of war with a strong naval power could only be maintained by a strong naval force. If the canal bristled with guns from one end to the other it would be of no use to the United States while a powerful hostile fleet dominated the Caribbean sea. The nation that controls the adjoining seas will in time of war control passage through the canal, no matter which one has possession. The canal will be located in a region that is practically uninhabited. A few resolute men could disable it with little danger to themselves. This danger of being temporarily disabled is a serious one, even in a war with a weak naval power. The destruction of a lock or embankment, which could be accomplished with a few pounds of dynamite, would bring about a total suspension of navigation for an indefinite period.

Suppose France owned, controlled and managed the Suez canal; what advantage would she derive from its being fortified in case of a war with Great Britain? Simply that of being able to deny its use to Great Britain—a negative benefit, the value of which is more than doubtful. The canal would become a military outpost impossible to re-enforce unless the British Mediterranean fleet could be destroyed or evaded. The concentration of British fleets might be somewhat delayed, but that is all. The mere ability to force delay would not be decisive. Great Britain, in control of the Mediterranean and Red seas, would control the approaches, and, though she could not send her own fleets through it, she could effectually prevent France from reaching it. France would thus be placed in the position of holding a military station of no value to herself, that she could neither abandon without loss of prestige nor make her hold on secure by reinforcements. The same would hold true with reference to an American isthmian canal in a war between the United States and Great Britain. Perhaps Great Britain could not capture the canal. She might not wish to, but by blockading it she could destroy its usefulness to the United States.

From a military standpoint the canal is valuable only as a shortened line of communication. It has no other value. It does not serve as a good base of operations in a war with a strong naval power. It occupies no threatening position in a war with Great Britain. No prudent naval commander would hold a fleet in Lake Nicaragua or Lake Bohia to spring out on the foe in either ocean, as has sometimes been suggested. If our enemy be weak, it would not be necessary; if strong, the danger of being bottled up is too great. The canal is simply a link in the chain of communications. No chain is stronger than its weakest link. Forge it as you will, the weak link in a war with a stronger naval power than ourselves is on either side. Munitions of war and troops would ordinarily be transported across the continent by rail, as that is a more expeditious route. As a line of communications it is badly located when considered in a war with a superior naval power. Instead of being in a protected position behind the main line of defense it is out beyond the skirmish line.

An adequate defense of a fortified isthmian canal can be made in no other way than by providing a navy of sufficient power to control the seas at either terminus. With such a navy at our command the canal needs no fortifications. What number of battleships, cruisers, etc., would be necessary to accomplish this end we do not feel competent to estimate; that is a question for naval experts to determine. Suppose, on the other hand, the canal were neutral. It would not then become a prize of war. Neither the maintenance of an army to protect it nor of a fleet to keep open communications with it would be necessary. Great Britain might possibly send ships through it, but even that is doubtful. The most that could be gained by doing so is a saving of time. Under some circumstances this might be an important matter, but the naval preponderance of Great Britain is such that time would be of less importance to her than to us. It is scarcely probable that it would ever be so important to her as to justify her in taking the risks of sending a fleet through a canal under American control. The canal is of more value to the United States than to any other nation. To keep it and the approaches open at all times would therefore be the aim of our government. But no amount of fortifications along the line of the canal would afford safe passage to a ship across the Caribbean sea.

It is believed, in consideration of the freedom of the canal extended by the United States to the ships of all nations, those nations would agree to an arrangement by which the region of the canal and large areas of the sea at each terminus should be exempted from the operations of war. The larger these areas of neutrality the better. But in view of the benefits to mankind which the United States would confer by the construction of the canal, there ought to be no serious difficulty in securing areas of the sea bounded by arcs of circles described with radii of, say, 100 miles or more. Should such an agreement be violated by any nation that is a party to it, the United States could destroy the canal, if necessary, so as to render it impossible of being used against us. As no nation except Great Britain would wish to use the canal for other than peaceful purposes of commerce, and as she probably would have no strong reason for using it in any other way, it is not seen why such an agreement might not be made. How such a status of the canal and adjacent waters can be effected are matters for statecraft to settle. The object of the foregoing remarks is to endeavor to show that a neutral canal with a large area of neutral waters at each terminus is, in the existing status of the naval powers of the world, a more useful canal to the United States from a military standpoint than one that is controlled by military power.

New York offices of the Babcock & Wilcox Co., well known manufacturers of water tube boilers, are now located at 85 Liberty street.

INTEREST IN MORGAN SHIP DEAL.

AMERICAN CAPITAL IS RECOGNIZING THE SHORTSIGHTEDNESS OF PAYING HUNDREDS OF MILLIONS TRIBUTE TO FOREIGN SHIP OWNERS.

The purchase of the Leyland and Atlantic Transport lines for large interests represented by J. Pierpont Morgan has served to direct as much attention to the subject of American shipping as the subsidy bill in the last congress, and it is the general opinion that the transaction will assist rather than hinder the chances of passing in the next congress a measure of help for our foreign-trade shipping. The statistical bureaus of the government are doing their share towards stirring up interest in the matter. One of the latest bulletins from the treasury department is to the point and especially interesting. It is in substance as follows:

Up to the time of the civil war the sailing vessel far outweighed, in all parts of the world, the steam-driven vessel in importance and in numbers, and the United States, with competent labor, abundance of raw material, with sailors trained for years in the deep-sea fisheries, easily took the lead in the building of great clipper ships. The general supposition is that American shipping declined when the era of iron ships began, and declined for the reason that such vessels could be constructed more cheaply in England than in this country. It is interesting to know, however, that this was not the primary cause. It was, in fact, due to the transfer of so many ships to foreign, and principally to English, owners through fear of loss from the numerous privateers which were commissioned to prey upon the commerce of the northern states during the civil war. In three years from 1862 to 1865, inclusive, vessels aggregating nearly 800,000 tons went into British hands, and thus transferred the American carrying trade. At the same time, the abnormal activity caused by the civil war in the ship yards in the English provinces aided Great Britain to equip herself with further fleets. With these advantages, and the American shipping dormant because of war's dangers, the British were enabled to confirm the position thus gained through the fact that the substitution of iron for wood began. The iron industry was far in advance in England at that time of the same industry in the United States, and consequently, when it was found that iron ships were more profitable and lasting than wooden vessels, British shipping supremacy was assured. A still greater advantage was gained when steel was substituted for iron, and so long as it was possible to manufacture the material cheaper in Great Britain, her position was unassailable.

A change, however, is now taking place, since it is possible to sell American steel ship plates on the Clyde, and therefore, as in the early days with the wooden ships, the advantage of cheaper material has once more returned to this country. It is this fact which justifies the belief that the United States is on the eve of a great impetus in ship building, which, in the very near future, will make it possible, through the reduction of cost, for American foreign commerce to be carried again under the American flag. The transition from wooden to iron ships caused the American ship builders to confine themselves chiefly to the demand of lake, coastwise and river trade, and many ship building plants were necessarily closed; but the stimulus given by the decreased cost of raw material, consequent upon the improved processes of steel manufacture in this country, and through the tremendous growth of American export trade, has resulted during the last few years in the establishment of several new ship building plants upon a very large scale on both the Atlantic and Pacific coasts. All the necessary facilities are now present for the construction of vessels of any desired tonnage. The margin of the difference in cost compared with that in British ship yards has with certain classes of vessels disappeared entirely. With others it is decreasing yearly. In extreme cases it is said to be between 15 and 25 per cent. in favor of the English yards. Experts declare that American labor is more efficient than foreign labor, and that in all essentials material is cheaper. The reason for the higher cost in this country, where such higher cost exists, is therefore explained as being due to the fact that there are certain standards in English and German ship yards, several great vessels being constructed at the same time upon the same lines; as, for example, with the mail steamers of the North German Lloyd and Hamburg lines, together with such vessels as constitute the Atlantic Transport line, absorbed by Mr. Morgan, and the Castle line, running from Southampton to South Africa. In this country, on the contrary, as a rule, each vessel is built from individual plans and patterns. The difference of cost, therefore, lies in the difference between wholesale and retail production.

If the demands hitherto restricted should reach the point where our present ship yards should receive orders for several vessels of the same type at the same time, there is little doubt that the cost of construction would be even less than abroad. Indeed, this fact has been demonstrated in the building of several sister ships of huge dimensions in an American yard for the Oriental trade. This country pays foreign ship owners, principally those of Great Britain and Germany, $200,000,000 a year for freights on American exports and imports. The Morgan deal already referred to, is not the only indication that capital has begun to recognize the shortsightedness of allowing this great tribute to go abroad. When to this is joined the fact that all types of sailing vessels may be built cheaper here than abroad, and that steam vessels may also be built cheaper here, when standard types are adopted, the necessary factors would seem to be present for the revival of American shipping and of American ship building upon a scale which may soon render the country independent of foreign vessels.

A second book of sailing directions for the great lakes has just been issued by the United States hydrographic office. It deals with Lake Michigan, Green bay and the Straits of Mackinaw. It will be remembered that the hydrographic office issued only a short time ago sailing directions for Lake Superior and the St. Mary's river. Books dealing with the other lakes will be issued later and then all will be put into one volume. The advance publications dealing with the different lakes are published at such a low price, however, that there is urgent demand for them. They sell at 30 cents each. It may be several months before all are published. The Lake Michigan book, alike to the one dealing with Lake Superior, contains valuable information regarding the compass, barometer, rules of the road, etc. These publications are for sale at the office of the Marine Review Pub. Co.

TWO MORE LARGE COASTERS.

STEAMERS FOR THE MORGAN AND CLYDE LINES LAUNCHED AT NEWPORT NEWS AND PHILADELPHIA—OTHER NEWS FROM COAST SHIP YARDS.

Another fine coasting vessel, the steamer El Dia for the Morgan line (New York-New Orleans service), was launched at the works of the Newport News Ship Building & Dry Dock Co. on Saturday. It would seem that for about ten years past the Newport News company has been engaged almost continually on new vessels for the Southern Pacific Co. (Morgan line). El Dia, alike to her sister ships, is a vessel costing about $600,000. She was designed by Horace See of New York, consulting engineer for the Morgan and Cromwell lines. Dimensions are: Length over all, 406 ft; length between stem and propeller posts, 380 ft. 8½ in.; breadth, moulded, 48 ft.; depth, moulded, to awning deck, 33 ft. 9 in.; gross tonnage, 4,665; net tonnage, 2,905. The hull is of steel throughout, the outside plating having vertical lap joints below the water line. The ship has three continuous decks and partial orlop deck at forward end of forehold. It is rigged with two steel pole masts and necessary booms for handling cargo, together with steam hoisting engines located at the different hatches. The deck houses, as in the case of all of the late vessels of the Morgan line, are of steel, with round side lights. The vessel has two cross hatches, with an improved arrangement of covers for convenience in handling, etc. The rudder is built up with center plate and made with stock in two pieces, coupled together below counter. The vessel will be provided with steam steering gear at forward pilot house, and a screw hand gear at the after house. There will be one Richtie compass with Hand's binnacle and stand in the pilot house; one Richtie compass with brass binnacle and stand on the bridge; one Sir William Thompson's compensating binnacle compass on main house and one Richtie liquid compass in the after house. A flying bridge connects the forward house with the main house. Steam windlass and steam capstans are provided for handling anchors, hawsers, etc. A complete electric light plant furnishes power for 112 incandescent lamps of sixteen candle-power each in engine room, deck house and crew space; portable lamps in cargo space; masthead light of fifty candle-power; side lights and a powerful searchlight placed on a stand on foremast. This stand is arranged similar to the crow's nest on the transatlantic ships and can be used for a lookout. A Russell-Sea running light control and indicator, connected with masthead and side lights, will be located in pilot house. Engines are to be of the triple expansion type with cylinders of 33, 52 and 84 in. diameter and 54 in. stroke. The distribution of steam in the high pressure cylinder is controlled by one piston valve; another valve of the same type performs a similar duty for the intermediate cylinder and two piston valves are used for the low pressure cylinder. The steam is introduced in the middle of high and intermediate valves, which prevents the high pressure steam from coming in contact with the valve stem stuffing boxes. All are worked by improved valve gear, with which each valve receives its motion from a separate eccentric. The valves are placed as close as possible to their respective cylinders. In the high pressure and intermediate valve gear, levers are introduced and connected to the stem and valve gear in such a manner as to cause the weight of the valve to counterbalance the weight of the connections below the lever, thereby dispensing with counterbalance cylinders. The engines are reversed by steam and controlled by a governor. The main pistons are constructed so as to dispense with the employment of tail rods and will at the same time insure their being steam tight without undue friction. The piston rods and the valve stems are fitted with metallic packing. The crank shaft is 16½ in. in diameter; crank pins, 16½ in. diameter by 16½ in. long; cross-head pins, 8 in. diameter by 9½ in. long. The shaft is fitted with adjustable thrust bearings, one for go-ahead and another for backing. The air pump, single acting, is 32 in. diameter, stroke 25 in. Total cooling surface in condenser is 6,400 sq. ft. An independent centrifugal circulating pump is connected to the condenser, sea bilge and ballast tank. The propeller is built up, the hub being of iron and the blades of manganese bronze. Steam is furnished by three double-ended boilers, 13 ft. 10 in. diameter and 20½ ft. long. Each boiler contains six corrugated furnaces, 43 in. inside diameter; total grate surface, 400 sq. ft.; total heating surface, 10,650 sq. ft.; working steam pressure, 180 lbs. There will be two hydro-pneumatic ash ejectors, a closed grease extractor and all other necessary conveniences for running the ship.

The Risdon Iron Works, San Francisco, Cal., has decided to install, in connection with their new ship building establishment, a Crandall marine railway. The railway is to be constructed mainly of steel and will be suited to ships of 480 ft. extreme length.

A second Clyde line steamer, which will rank among the best of the freight and passenger vessels on the Atlantic coast, was launched Saturday at the works of the Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, and named Arapahoe. The vessel was christened by Dorothy Cramp, daughter of Mr. Edwin S. Cramp. The dimensions of the Arapahoe, which is a sister ship of the Apache, launched on March 30, are: Length, 303 ft.; beam, 48 ft.; depth, 30 ft.; with accommodations for 200 passengers, and space for 3,000 tons of cargo. The Apache and Arapahoe will ply between New York and Charleston and Jacksonville.

At the ship yard of the Union Iron Works, San Francisco, a few days ago, the Alaskan, largest merchant steamer ever built on the Pacific coast, was successfully launched, and work on machinery and other parts is so well advanced that the vessel will be in service much sooner than is usual after a launching. The Alaskan belongs to the American-Hawaiian Steamship Co. She is of 12,000 tons gross burden, and is intended to run between San Francisco, Hawaii and New York.

The Harlan & Hollingsworth Co., Wilmington, Del., has contracted to build a double-decked screw ferryboat, for the Riverside & Fort Lee Ferry Co. of New York, of the following dimensions: Length over all, 180 ft.; beam, moulded, 38 ft.; beam over guards, 60 ft.; depth, moulded, 15 ft. 6 in. The motive power will consist of a three cylinder compound engine supplied with steam by two Scotch boilers.

Wm. E. Woodall & Co. of Baltimore have purchased additional property adjoining their ship yard and contemplate the construction of a floating dry dock as well as a large machine shop.

Another of the torpedo boats building at the Bath Iron Works, the Biddle, was launched Saturday. The Biddle is a sister torpedo boat of the Bagley and Barney.

WHERE THE OLD WOODEN SHIPS HAVE GONE.

In the year 1877, the epoch of the old time big wooden sailing ship was at its height, and no less than twenty-five were launched from Maine yards. Until the recent revival of shipping, a full-rigged American ship was something of a novelty, and here the question arises as to where they are all gone. To be sure there are a few left, such as have not been burned, wrecked or converted into barges, which latter fate seems bound to overtake the last of the old fleet. The list of 1877 is an interesting one and in that year craft were set afloat whose history would make big books and interesting ones. In that year the chips were flying in yards all along the Maine coast, many long since grass-grown and effaced. In addition to the ships there were also many brigs, barks, schooners, etc., on the stocks. But as this particular sketch has reference to a ship, look at the list of the famous craft born in 1877.

At Bath went over the ships C. C. Chapman, Belle of Bath, Palestine, Challenger, Daniel Barnes, Hecla, St. Mark, St. David, Florence and James Yesmith; at Thomaston, the Baring Brothers, Levi G. Burgess and Alex. Gibson; at Freeport, the Sintram; at Searsport, the William H. Conners; at Waldoboro, the Willie Reed; at Kittery, the Granite State; at Camden, the Wandering Jew; at Damariscotta, the Normandy; at Kennebunk, the Vigilant; at East Deering, William G. Davis, and many others. These ships have carried the stars and stripes to many climes, and their days were the glorious days of the old-time square-rigged, deep-water skipper.

In the year 1877, was launched at Brewer a big ship, the Llewellyn J. Morse, named for Capt. L. J. Morse of Bangor, and it might be mentioned that in the same year the schooners Empress, Lester A. Lewis, and the brig Havilah were also launched on the river, the latter from a Bangor yard. The name of the Llewellyn J. Morse does not appear in the shipping reports these days. One might haunt the docks of the Atlantic coast from Passamaquoddy to Corpus Christie and speak every incoming craft, but none could give any tidings of a ship called the Llewellyn J. Morse built at Brewer, Me., in 1877, 1,325 net tonnage, and which would show the signal letters J. S. L. V. The famous old ship has dropped out of society. Many who noted her comings and goings have lost all track of her. Her old chums are nearly all out of it, wrecked, or worse—coal barges. The fact is that the Morse and a dozen other fine Yankee-built craft that were once in the aristocratic trades of Hong Kong, Manila, Singapore, Melbourne and The River, form a little fleet of old-timers that, to escape from the poor house, as it were, have hidden themselves away in a trade where they are seldom heard from or reported. Many an old-time skipper will tell you that he thinks the Geo. Skolfield, the St. Nicholas, the Sterling, Eclipse and others that might be named—and the Llewellyn J. Morse were dead long ago. But they are still afloat.

Scattered along almost the entire coast of Alaska are long, low, rough buildings on shaky piles—salmon canneries. In most cases the wild and barren wilderness grudgingly allows but a strip of beach barely wide enough for the buildings and the rougher shacks in which the operatives live for a time. The Alaskan coast is something like that of Maine, with many islands, inlets and bays. These are alive with salmon and redfish—big coarse fish when compared with the Penobscot article, but red of flesh and nice to look at and eat by those who know nothing better. A score or more of syndicates operate these canneries in the season, but the exigencies of the business require that they bring their employes with them, for where the salmon are most plentiful there are no inhabitants except a few lazy, half-civilized Indians. The canning companies for the most part have headquarters at San Francisco. Here, in the early spring, they fit out their transports for the canneries. Some own and some charter good-sized craft, for they must carry from 200 to 400 people, including the Chinese who make the cans and pack the fish, as well as the fishermen, engineers for the seine steamers, and supplies of all kinds. And this is what the solid old Maine ship the Llewellyn J. Morse has come to. For a few months she is tied up at San Francisco, then with a miscellaneous cargo she heads far to the northward for Chiknik bay, where all summer, high and light, she swings at her moorings in the sheltered bay which receives the waters of the Chilkoot river. In the fall, when the season is over, she is docked, and case upon case and ton upon ton of the canned salmon are stored away in her spacious hold, the doors and windows of the canneries are nailed up, the boats housed, and with the last man on board, the Yankee craft heads down the coast once more. Her skipper probably never heard of Llewellyn J. Morse of Bangor, or Bath or the Penobscot river, but the craft is considered a pretty good ship yet. The Chiknik Bay Packing Co., who now own her, put down her value as $25,000.

But the Llewellyn J. Morse is not the only Maine-built craft that is dodging the coal barge fate up towards the Behring sea. The bark Nicholas Thayer, built at Thomaston in 1868, carries the supplies of the Alaska Salmon Packing & Fur Co. to Loring on Naha bay, and has as a consort the bark Electra built at Boston in the same year. When the ship Geo. Skolfield, 1,275 tons, was built far up the Kennebec at Brunswick 30 years ago, the Bowdoin class prophet did not foretell that the beautiful craft to which he alluded by way of a very pretty and convenient simile in connection with the class of '70, would ever be freighting Chinese laborers up the Pacific coast, but that is what the Glacier Packing Co., who can salmon at Point Highfield, Wrangell island, use the one-time pride of the Kennebec for.

And there are still others. The ship Invincible, built at Bath in 1873, runs to Pyramid Harbor, Chilkoot inlet; the bark Prussia, Bath-built in 1868, goes to Kadiak island for the Arctic Packing Co., also the ship Santa Clara, built at Bath in 1876, and the St. Nicholas, built at the same port in '68, are in the same business. Of others of the salmon fleet, which years before slid into the Atlantic waters on the Maine coast, is the ship Meron, built at Phippsburg in 1870; bark Kate Davenport, Bath, 1866, rerigged from a ship; ship Sterling, Bath, 1873; ship Eclipse, Bath, 1878; ship Bohemia, Bath, 1875; ship B. P. Cheney, Bath, 1874; and the bark Coryphene, built at Millbridge in 1878.

Several large ships and barks built in Massachusetts help make up a considerable fleet which head northward for salmon every spring. But for a proud Yankee ship to carry Chinamen, loaf all summer and then load up with imitation Penobscot salmon, seems very much too bad.

The government's new floating dry dock at Havana was launched a few days ago. It will float vessels of 6,000 tons and will be ready for use in about six months.

STAUNCH SUPPORTER OF SHIPPING BILL.

NO DOUBT REGARDING THE POSITION OF LEWIS NIXON ON THE QUESTION OF SUBSIDIES—HIS TESTIMONY BEFORE THE LAST CONGRESS.

Some of the newspapers in the east have raised a question regarding the position of Lewis Nixon, well known ship builder and one of the leaders of Tammany in New York, on the subject of subsidies for American ships. There is no doubt of Mr. Nixon's position in this regard. Mr. Nixon was strongly in favor of the shipping bill introduced in the last congress. He went to Washington to assist in the effort to secure passage of the measure. He was one of the witnesses before the senate and house committees who spoke in favor of the bill. In the course of his remarks before the senate committee he said:

"As a general proposition I am opposed to the tariff. I cannot help, however, the fact that this country is upon a protection basis, and being upon such protection basis I think that the great industries of ship building and ship owning which are unprotected today should get some share of the protection that all other industries get. We pay to foreign ship owners some people estimate, about $200,000,000 a year. I think if we take in all the outside and contributory interests we will find that it will probably reach up to $300,000,000 a year for carrying our goods and passengers. That is in the form of passage money, freight and insurance and the various expenditures connected with transfer with our people and our products. That being the case, if by paying $3,000,000 or $4,000,000 the first year and gradually increasing to $9,000,000 we can keep the greater part of that enormous sum of money in this country, it is certainly a good business proposition. But there is hardly any occasion for arguing on that, as every party has declared for upbuilding the merchant marine in the foreign trade, and it is only a question now of methods. As to the idea of free ships we cannot consider it because even if the foreigners gave us the ships we could not run them under our flag. I think everybody appreciates that. That being the case we might as well dismiss that idea. Its only possible result could be to kill American ship building, as everybody would go abroad to get ships.

"A vessel sailing under the American flag has to pay her men more wages than the same kind of ship sailing under a foreign flag. Besides that, you will find the crews much smaller on the foreign ship; that is another reason why they can run them cheaper. Our ship owners are bound by the requirements of our laws, to which foreign ship owners are not subject. These big merchant ships are built cheaper abroad than in this country. All the legislation we want is that which will equalize the conditions. And that is what this bill will do. In other words, if it costs Americans to run a certain line under their flag $30,000 or $40,000 more than foreigners can run a similar line for, we want to be helped just that much for some years in order to allow American enterprise to establish itself and overcome the other man by better management and by better catering to the needs of the service. In other words, all the ship owners want to have is equalization, and then they will be satisfied to work out their own salvation, and if in the course of time they cannot do it under the help given by this bill, then it is their fault; but they will do it, as we all know who have faith in the American character. The first ships that start will get a certain amount, according to the rates given in the bill. As the tonnage increases the limitation of $9,000,000 a year will, of course, gradually decrease the amount received by each ship, because this bill is sure to add to the merchant marine. Nothing can stop it. That being the case, you will find that the various ships and the various lines will be developed, and the great development will begin during the first five years, inside of the twenty years' limit fixed by the bill. American ships will have got the good will of the trade and have induced the people of other countries to take American products, and will have taught the people to know and appreciate American vessels, and as that has been going on the vessels will need less and less encouragement. At the end of the twenty years the small encouragement that the various ships have had distributed to each of them will be such that it can be stopped without a radical shock.

"When the bill becomes a law the construction of ships for the foreign trade and the organization of new American lines will begin at once. The owners will establish agencies and send out drummers throughout the world. They must make their connections from this side. It is to their interest to go out for all the business they can get. They will make arrangements with the railroads. Great movements of grain at certain times of the year will be brought about and the railroads will give these lines the benefit. And you will find that there will be a great upbuilding of trade. You encourage our ship builders to carry freight. They will resist every effort made by others to get that freight, and that will reduce the freight rates. The ship builders want no aid from the government. All they ask is a steady demand for ships which will enable them to do business on the wholesale scale instead of by retail. In one year the English build thirty ships for the foreign trade where we build one. Whenever we get to building on the wholesale scale we can build as cheaply, if not more cheaply, than does Great Britain. You cannot get a steady and liberal demand for ships, except you base it on an increasing demand for goods, carried in American bottoms. Once given that demand and the American ship builders will rise to it. But it will take a little time, just as it did in the navy. By adhering to a steady policy of building all our naval vessels in American yards in sixteen years we have been able to produce a navy absolutely home-made and superior to what it would have been if we had followed the policy of buying those ships abroad. Before the encouragement given by the navy to our ship yards they simply managed to exist on the demands of the coasting trade. Look at what a little encouragement from the navy has done. Besides giving direct employment to the men who built the ships, it has developed many contributory industries. From that encouragement great steel industries have been built up in this country. That has given employment to additional men, consuming more products of the farm and of other industries. We want such encouragement as Germany has given and which has built up so wonderfully the merchant marine of that country in a comparatively few years.

"As regards the general character of the shipping bill, it attracts me from the fact of its democracy. It treats the poor man who builds a schooner as fairly as the rich man who builds an ocean liner. That comparatively poor man gets pay under the bill and is able to compete for trade with a very large ship and the compensation under the bill to the large, powerful steamships is not as great proportionately as it is with the slow-going sailing vessels, as great power is an expensive luxury. The bill, should it become a law, would really be a great measure of economy. The utmost that could be expended under it in twenty years would be $180,000,000. Suppose that we kept at home $80,000,000 a year of the $300,000,000 that we now give to foreign owners—and that amount would be greatly increased before the twenty years expired—it is plain to be seen what a great saving it would be to the nation. It is a good business proposition."

AROUND THE GREAT LAKES.

Capt. James Barry has been reappointed harbor master at Chicago.

Riebolt, Wolter & Co. of Sturgeon Bay, Wis., have been given an order to build for Wm. Smith & Co. of Waukegan, Ill., a wooden fishing tug that is to cost about $6,000.

Four barges owned by J. C. Gilchrist of Cleveland, which have been in service on the Atlantic coast for some time past, will be started on their return to the lakes about June 1.

Sales of vessels: Steamer Belle, Graham & Morton Trans. Co. of Chicago, to J. A. Cuisick at $7,500; schooner Mary E. Ludwig, Capt. H. Raffinand to W. Spoon of South Haven, Mich.

Work is to be hurried at the West Superior yard of the American Ship Building Co. on the large steel freight steamer building there for the Milwaukee Tug Boat Line and it is expected the ship will be completed in October. She is now partly in frame.

C. T. Fairbairn, formerly of Ishpeming, Mich., has been appointed superintendent of the Jones & Laughlins mining properties on the Mesabi range. Mr. Fairbairn was formerly agent of the Winthrop Mining Co., at Ishpeming. His headquarters in future will be at Virginia, Minn.

Col. Anderson, chief engineer of the department of marine and fisheries, Canada, announces that owing to shifting sands it has been found impracticable to place the proposed new light-house on Southeast shoal in Pelee passage, between Pelee island and Pelee point, Lake Erie, and the structure will, therefore, have to be placed on the middle ground as originally contemplated.

The St. Paul railway company's new ore dock at Escanaba is in service. The length of this dock is 750 ft., width 52 ft. at the top and 59 ft. out to the fender rails, height 66½ ft. from water line. It has 120 ore pockets, each of 250 tons capacity, making a total capacity of 30,000 tons. The approach to the dock embraces 2,760 ft. of piling and timber trestle, while the entire pile protection extends 4,810 ft.

W. J. Wood, formerly naval architect for the Goodrich line, has been awarded the task of designing and superintending the construction of the new $100,000 fire tug for the City of Milwaukee. Mr. Wood was the designer of the fireboat Illinois, which cost $80,000, or $20,000 less than will probably be expended on the new Milwaukee boat. It is expected that the Milwaukee boat will be built at the South Chicago yard of the American Ship Building Co.

Robert D. Wagstaff, marine editor of the Detroit Free Press, whose death was announced a few days ago, was one of the few men on daily newspapers of the lakes who were given opportunity to become acquainted with the technical side of their work. Wagstaff knew all about a ship and had a wide circle of acquaintances in the lake region. He made a reputation for the Free Press from a marine standpoint but poor health of late years interfered with his work.

Signals relative to depth of water in the vicinity of the Lime-Kilns, Detroit river, will be displayed again this season from Smith's coal dock and from the dock of the Pittsburg Coal Co. at Sandwich. The signals will for the present show depth up to 18 ft. and no more. In event of difficulty in securing the information, on account of wires being down or from other causes, two red lights, one above the other and 5 ft. apart, will be displayed by night and a red flag by day.

The first of two steel freight steamers building at the Lorain works of the American Ship Building Co. for the Peavy Steamship Co. of Duluth was launched Wednesday and named Frank H. Peavey. The second vessel, to be named Geo. W. Peavey, will be launched in about three weeks. Two other steamers, alike to the Lorain vessels in every way, are building for the same company at South Chicago. These vessels are each 450 ft. over all, 430 ft. keel, 50 ft. beam and 28½ ft. deep. They will have quadruple expansion engines with cylinders of 15, 23¾, 36½ and 56 in. diameter and a common stroke of 40 in. Steam will be furnished by two Babcock & Wilcox water tube boilers in each ship. Capacity is about 6,400 gross tons and approximate cost $275,000.

A second line of passenger steamers will be in operation during the coming summer between Toronto and the Niagara river district. Toronto Navigation Co., Ltd., is the name of a new corporation. The capital is $100,000. It is understood that the company has already secured its first steamer, which will start the season about May 24, and that a second boat will be put on the route early in June. The company's Totonto offices are at 52 Yonge street, and its steamers will daily leave Geddes' wharf, at the foot of Yonge street. The terminals of the line on the south side of the lake will be Niagara-on-the-Lake, Ontario, and Youngstown, N. Y., just across the river from Niagara. Between those points, each of the company's boats will make two round trips, five days in the week, and three round trips on Saturday, the last return boat leaving Youngstown late on Saturday night.

Vessel owners of Cleveland announced after a conference with officials of the public works department of the city, a few days ago, that the time has arrived when the city should carry out the same policy that has been inaugurated in other large ports, such as Buffalo and Chicago, of removing, wherever possible, center piers from the river, by the adoption of bridges of the rolling lift kind. It had been proposed to construct a second channel to the west of the center pier of the large Superior street viaduct. This project would not only be very expensive, but there were serious objections to it other than the general objection to center piers. The vessel owners concluded that the center pier of this viaduct, as well as the pier of the Valley railroad bridge near by, are a continual menace to navigation in a part of the harbor that is very much crowded, and they will do all in their power, working in harmony with the city officials, to secure funds for the construction of the proposed lift bridges.

CONSTRUCTION OF TORPEDO BOATS AND DESTROYERS.

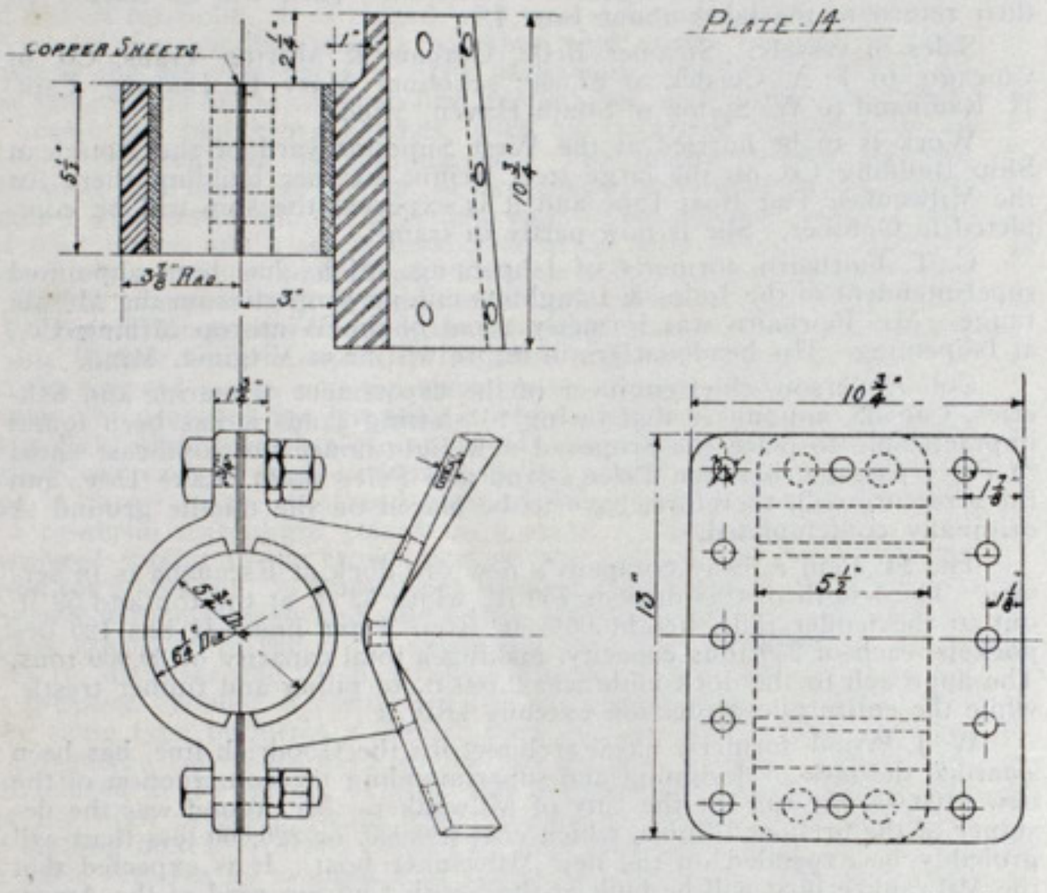
BY GEORGE HERBERT WILSON.

RUDDER STUFFING BOXES.

In the design of this fitting, in connection with the rudder, consideration must also be given to the fact of its great importance as regards forming a part of the hull structure. Three separate functions are to be dealt with in this fitting. First, it has to form a proper bearing surface for the rudder stock; second, it must form a stuffing box around the stock; third, it must be so constructed as to thoroughly distribute the strains to the hull structure in the vicinity, and make a strong, water-tight connection.

In dealing with the first requirement a knowledge of the pressure to be resisted must be had, sufficient bearing surface being provided to carry it, and everything possible done to decrease the friction at that point. The diameter of the rudder stock in the wake of this bearing is generally

PLATE 14



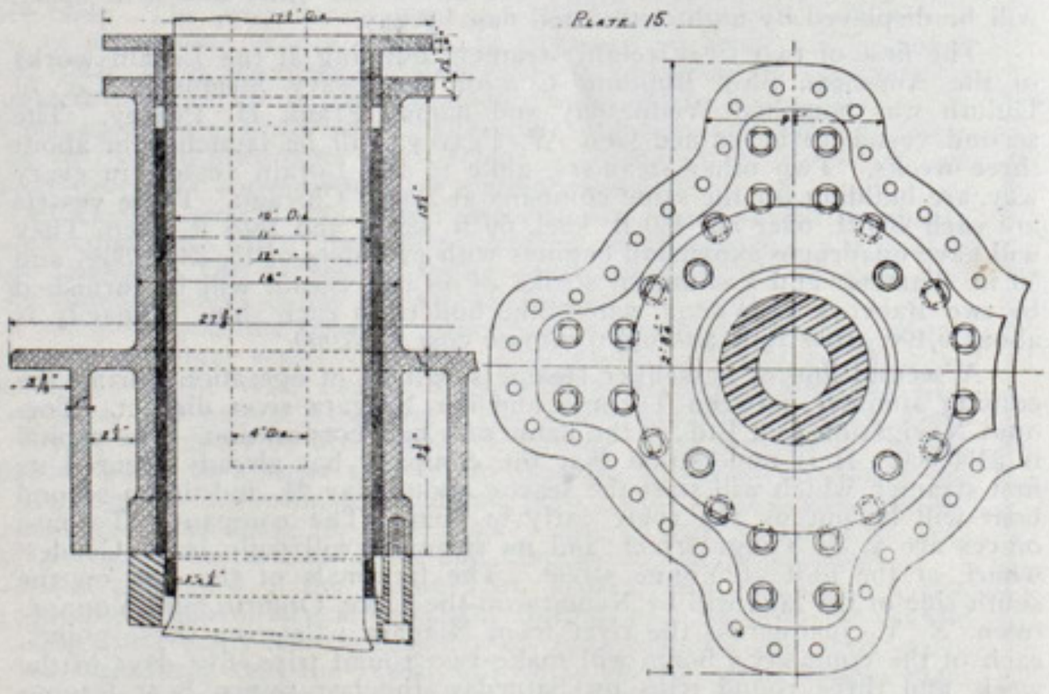
increased and has a brass sleeve shrunk on, as mentioned in the last article. To further decrease the friction at this bearing, white metal is generally run in, and bored out to suit the stock.

To withstand the strains of the rudder the bearing must be rigidly supported by the hull structure, which is generally augmented in this locality for this purpose. A box arrangement of the hull structure, formed by fore-and-aft intercostals and the transverse floor plates, gives a very strong support, vertical palms on the rudder bearer making a strong connection thereto.

As regards the conditions of a stuffing box it has only to do with the protected type of rudder, the overhung type not requiring it. The ordinary style of gland, packing and bolts is all that is required in this direction.

The third consideration, that of securing an absolutely water-tight

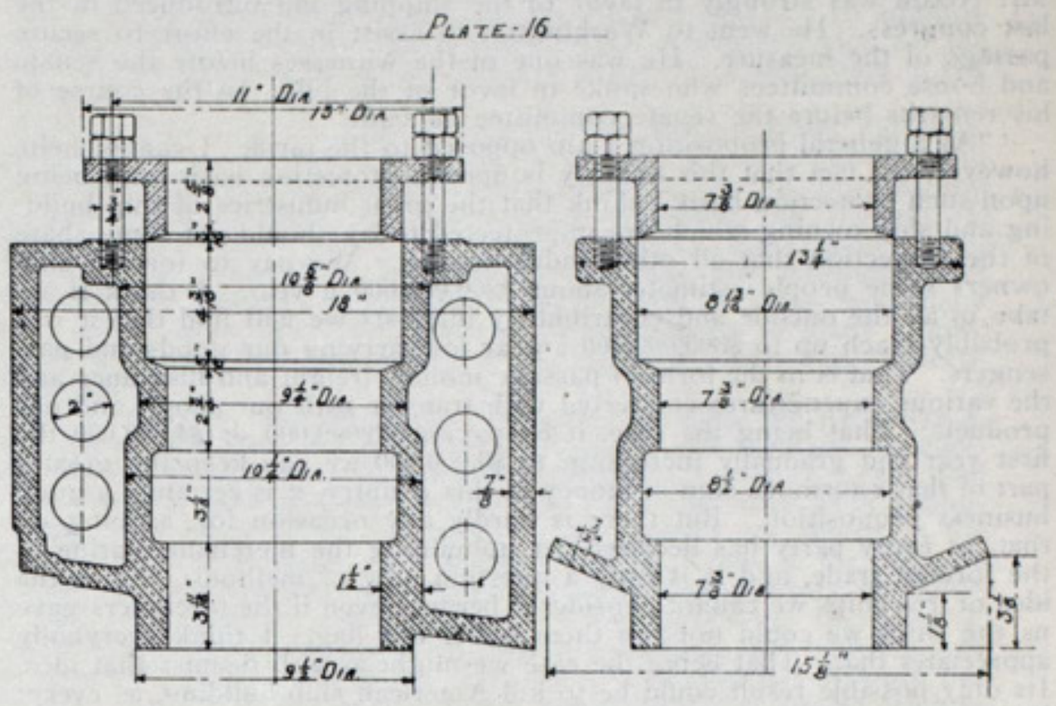
PLATE 15.



connection at the shell, is one demanding considerable attention. In the construction shown on plate 15 this was somewhat of an afterthought, and as a result of its not receiving sufficient attention in the design considerable trouble was experienced in securing the desired results. In the other type shown no such difficulty was found and a more rigid connection was secured. Considering the locality of this fitting, being placed as it is at the seat of greatest vibration, the question of a water-tight connection is an all important one, and too much stress cannot be laid upon it. It is a well known fact that in boats of this type, when running at high speeds, the stern has a tendency to squat, and with the great amount of water thrown upward by the propellers, the increase in the water pressure is considerable, thus requiring special care in the matter of a tight connection. In the types of rudder bearings and stuffing boxes shown in this article, I have practically covered the field of experience gained along this line.

Starting with the rudder bearing shown in plate 14, the fittings for the overhung type of rudder are presented. The main part of this casting is riveted to the hull structure, which is strengthened in the vicinity to withstand the strains. This casting is in two parts, the outer half bolting in place after the rudder is secured in position. A special recess in the rudder, as shown in plate 11, allows for securing this in place. Sufficient

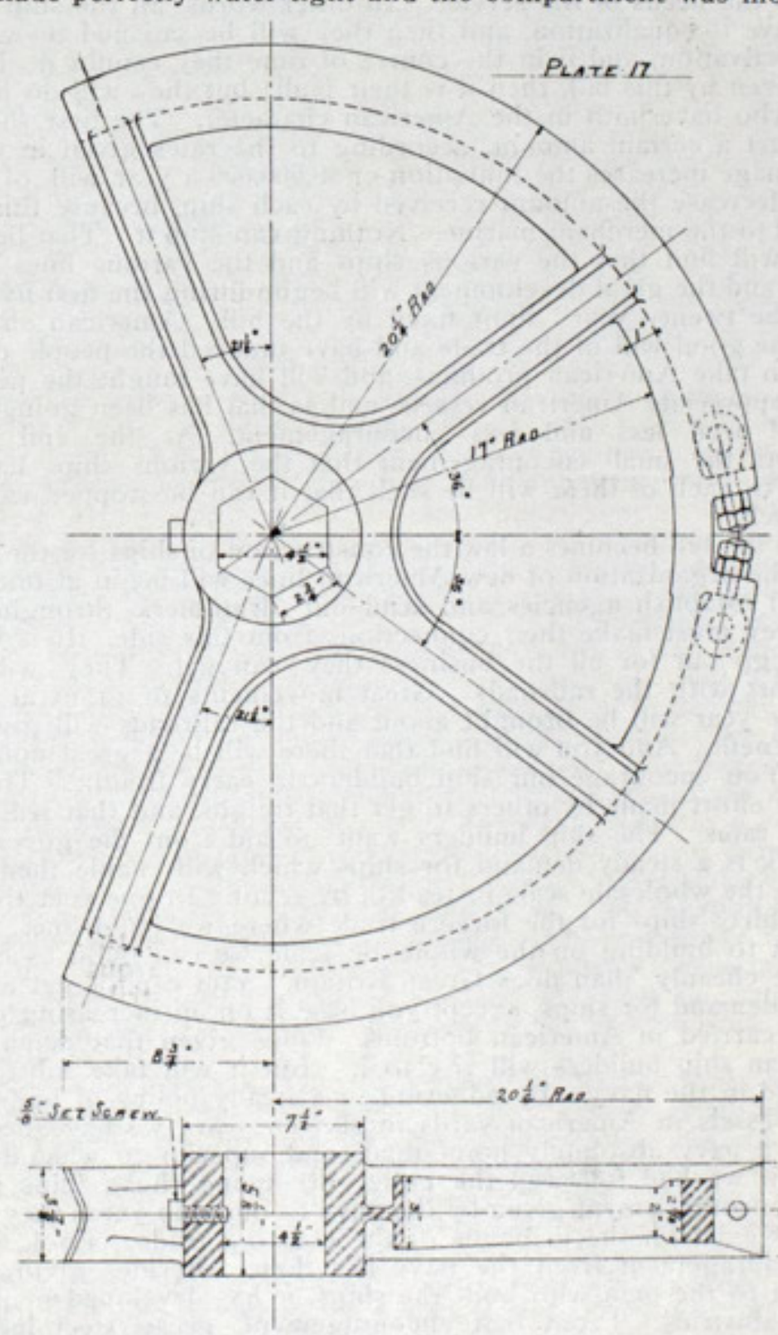
PLATE 16.



surface was provided to give a good bearing and it was found a very rigid support and worked very satisfactorily.

In the next method of construction, plate 15, the arrangement for the protected type of rudder is shown. In this case the main part of the bearing is carried up above the floors, and is secured by bolting a circular palm to a plate riveted on top of the floors. Vertical palms also provide connection to the floor plates and intercostals. No connection was made to the shell plating at first, and it was in this instance that trouble was experienced in securing a water-tight job. The floors and the intercostals were supposed to form a water-tight box around the rudder bearer, and the horizontal palm to make a water-tight connection at the top. The desired results were not obtained, however, as the box arrangement could not be made perfectly water-tight and the compartment was more or less

PLATE 17

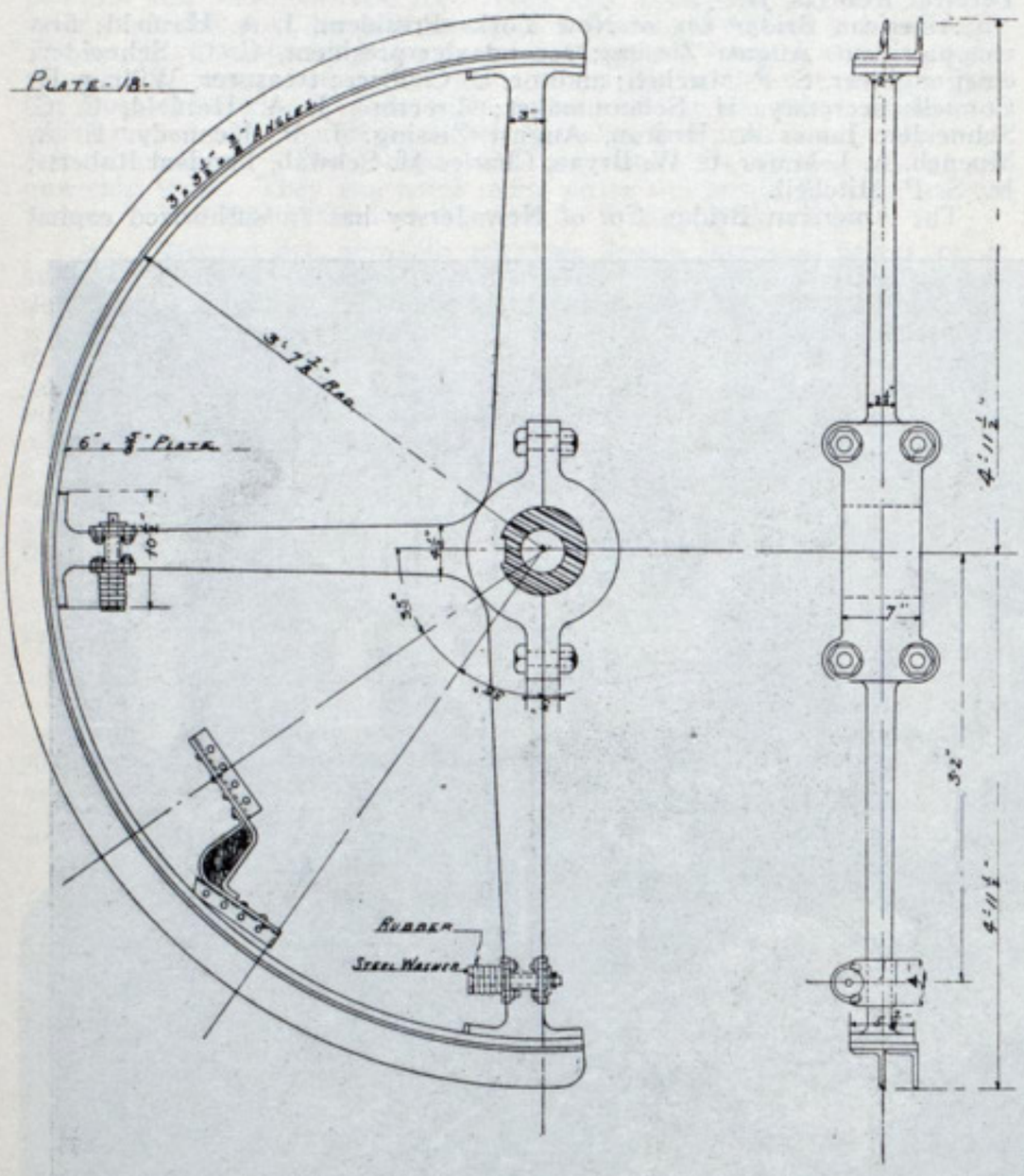


flooded, especially after a run at high speed. Considerable difficulty was experienced in overcoming this and the makeshift arrangement shown on plate 15 gives some idea of how it was accomplished. A rust joint was made between the two castings, and after tapping the shell plating to the lower casting, it was caulked while the rudder was unshipped. This defect was wisely overcome in the following boats as is shown on plate 16. The great fault in the construction under discussion, outside of the question of water-tightness, is that the bearing part is carried up too high above the floors and too much weight is required to gain the support

necessary for such construction. Following the general practice, the bearing was brass bushed and the upper part was made in the form of a stuffing box, a gland and the necessary bolts being provided.

In considering the last method of construction, a glance will suffice to show the superiority of this fitting over the one with which the previous discussion had to do. As regards the first requirement, rudder bearing, it has all the good points of the former types with the advantage of being so constructed as to distribute the strains in a better manner than the foregoing type, and of being placed where a better connection can be made to the surrounding structure. White metal was used for the bearing surface and carried the brass sleeve shrunk on the rudder stock. A stuffing box gland, bolts and packing provided for water-tightness around the stock.

The manner of securing a water-tight connection is very simple. Tap rivets and through rivets secured the shell plating to the casting, the edge being carefully caulked. The whole design of this fitting indicates a careful study of its various requirements and functions and all seem to be well taken care of. Ample connections to the floor plates and intercostal



plates are made by the vertical palms and with the rivets and taps connecting the casting to the doubled shell plate, a very strong arrangement was secured.

From a summary of all the different requirements and the proper fulfilling of the same it would seem that the first and the last types of this all important fitting are the best to follow in the design of the different types of rudders.

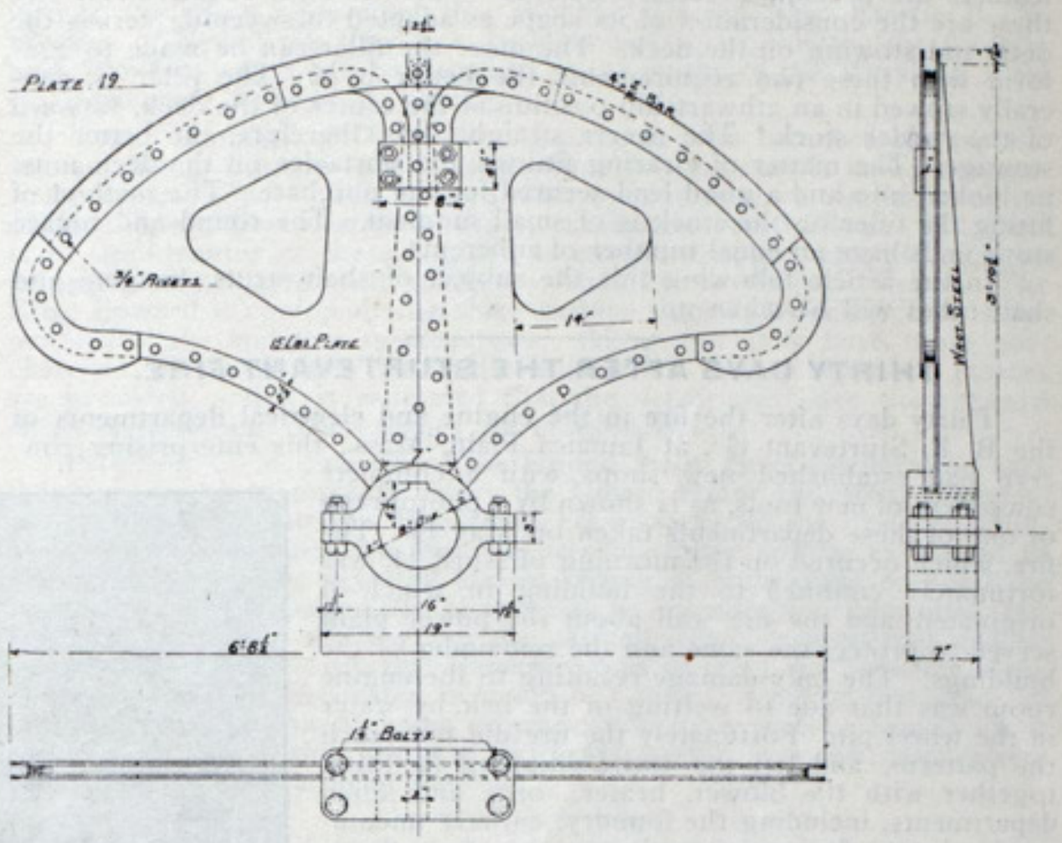
RUDDER QUADRANTS AND TILLERS.

In connection with this fitting there are several important considerations, the combination of which is generally followed in the best design. The principal functions devolving upon this fitting are those of transmitting the power from the steering ropes to the rudder, by way of the stock, and to carry the steering ropes along in such a manner as to eliminate the possibility of any slack appearing in them between the quadrant and the last riding sheave. Having a knowledge of the power to be applied and the consequent strains to be resisted, for performing the first of these, the quadrant can be designed of sufficient strength to fulfil the same. In addition to this it must be of such strength as to carry its own weight properly. The general practice followed in caring for the other requirement is to allow for single or double grooves in the quadrant in which the ropes are carried. This practice is beneficial in distributing the strains along the periphery of the quadrant and increasing the efficiency of the steering arrangements. The majority of rudder quadrants are made in two parts, the dividing line being in different places. This practice is followed as being easier to install. Generally the quadrants are clamped in position as the rudder stock enters the ship through the lower bearing, it being found more easily done in this way. The rudder stock, as shown in previous sketches, is turned down at a point under the deck to receive the quadrant and a collar is formed to carry the weight. In some cases the stock at this point is made square to receive such a shaped quadrant.

In reviewing the various types of quadrants extant I have chosen three styles to show the diversity of construction to obtain practically the same idea. It remains to prove the advantage of one over the others and accept it as an efficient type. The first of these to be dealt with was used on a medium-speed class of boats, about 24½ knots, and the power applied can be seen by reference to the table in one of the foregoing articles. This quadrant was made up in two parts, the dividing line being the same as a fore-and-aft line through the center of the boat, the material used being cast steel.

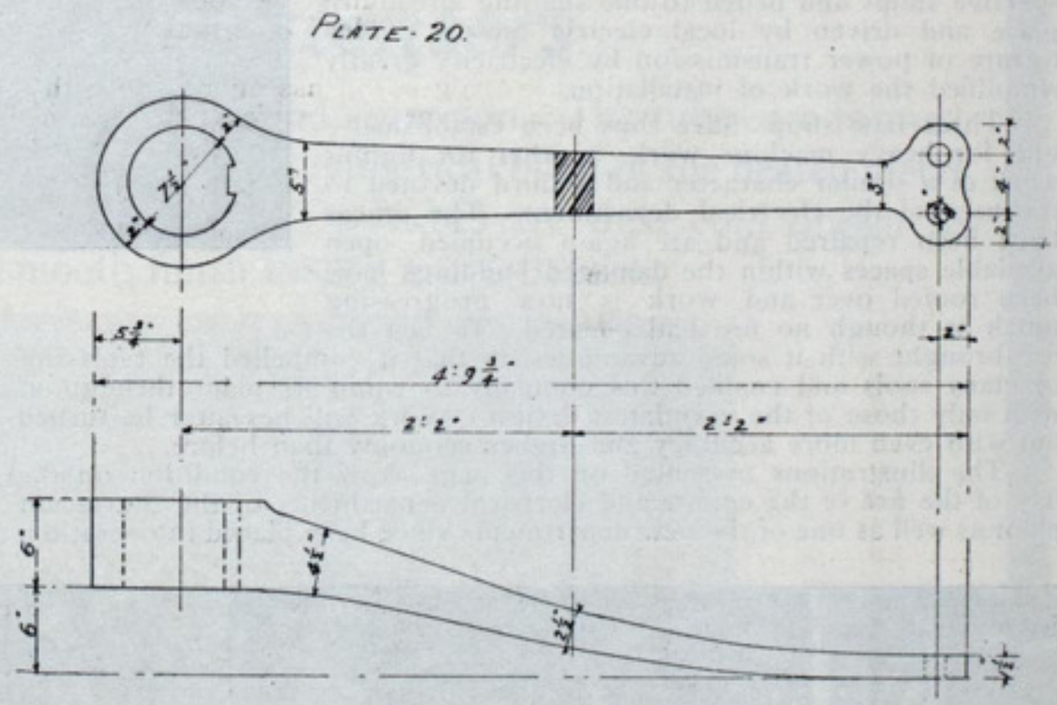
The rim carrying the wire rope was made of the same section as wire rope sheaves are generally made. A lug cast on the rim on each side allowed for an adjusting bolt. This bolt was fitted with a nut and lock-nut and engaged the wire rope by means of an eye in the bolt, through which the rope was worked, turned back, and spliced. The shape of this quadrant, the rim extending back as it does beyond the central point and having only a single groove, allows for sufficient wrapping of the rope to do away with any possibility of slack occurring in the rope and gives good frictional bearing surface for the rope.

This quadrant was fitted over a square bearing on the rudder stock and was bolted together after the stock was in position. A stopper, built of plates, angles and rubber bumper, was located forward of the stock under the deck and engaged the two end arms of the quadrant. This



formed a very efficient rudder stopper and was located at the extreme angle of the rudder. This quadrant is shown on plate 17.

The next quadrant under consideration is shown in plate 18 and represents one installed on a 30-knot boat of about 350 tons displacement. The construction in this case varies considerably from that previously discussed, and has points in its favor and against it. In this case the quadrant proper was made of cast steel, the casting being simply the hub, arms and a wide flat rim. The grooves, two in number, extending the entire length of the rim, were built up of angles riveted to the wide rim. An arrangement for fastening the rope at the end of each groove engaged the steering rope from the opposite side of the boat; that is, the starboard rope was fastened at the port side of the quadrant and vice versa. This arrangement, it will be seen, precludes any tendency for slack in the rope to occur and forms a friction bearing for the rope all the way around the quadrant. These grooves, being formed of angle bars riveted heel to



toe, as they were, cannot compare in efficiency with the groove in the quadrant just under discussion, in that the grooves are flat-faced while in the former type the groove was made semi-circular to fit the rope, thus preserving the rope from any tendency to flatten out and deteriorate. The great length of these grooves was somewhat in error, considering the extra weight it entailed, as a single groove proportionate in length to that of the former quadrant would have been all that was required. The principal faults of this quadrant are its excessive weight and its flat grooves.

In dealing with the last quadrant, shown on plate 19, the conditions were a 29-knot boat of about 420 tons displacement. In this construction the weight was materially reduced from that of the foregoing type, considering the vast difference in the displacement and the small difference in the speed. But this fault being overcome, there are still other improvements which could have been made in the design of this quadrant had previous designs and features been available. This quadrant, as can be seen, is of the built-up type, the casting forming the main arm and the hub being the foundation of the construction. On top of this was riveted a plate of the peculiar shape shown with flat bars around the edge to form the grooves. The whole construction was very light and made a very rigid quadrant. The fault of the groove being flat is a parallel error with the foregoing quadrant. The length of the groove in this case was

somewhat foreshortened by the rounded ends and it would have been better to have made it about like the first quadrant shown.

The method of securing the wire rope is to pass it under a block clamp, the ends of the rope being turned back and spliced, making a swell which cannot slip through. The hub was made in two parts, having four bolts and a key to fasten it on the stock. This last quadrant seems to be along the line of the best construction, provided the changes as to the shape and length of groove were made.

In the matter of tillers there is not much to be said, as the construction is very simple and the room for improvement so small. One or two features are perhaps necessary outside of the strength requirement, and these are the consideration of its shape as adapted to sweeping across the deck and stowing on the deck. The more the tiller can be made to conform with these two requirements the better it is. The tiller is generally stowed in an athwartship position at the center of the deck, forward of the rudder stock. The nearer straight it is, therefore, the better the stowage. The matter of clearing fittings and obstacles on the deck must be looked into and a good lead secured for the purchase. The method of fitting the tiller on the stock is of small moment. The round and square stock ends have an equal number of adherents.

In the article following this the subject of shaft struts, hangers and shaft tubes will be taken up.

THIRTY DAYS AFTER THE STURTEVANT FIRE.

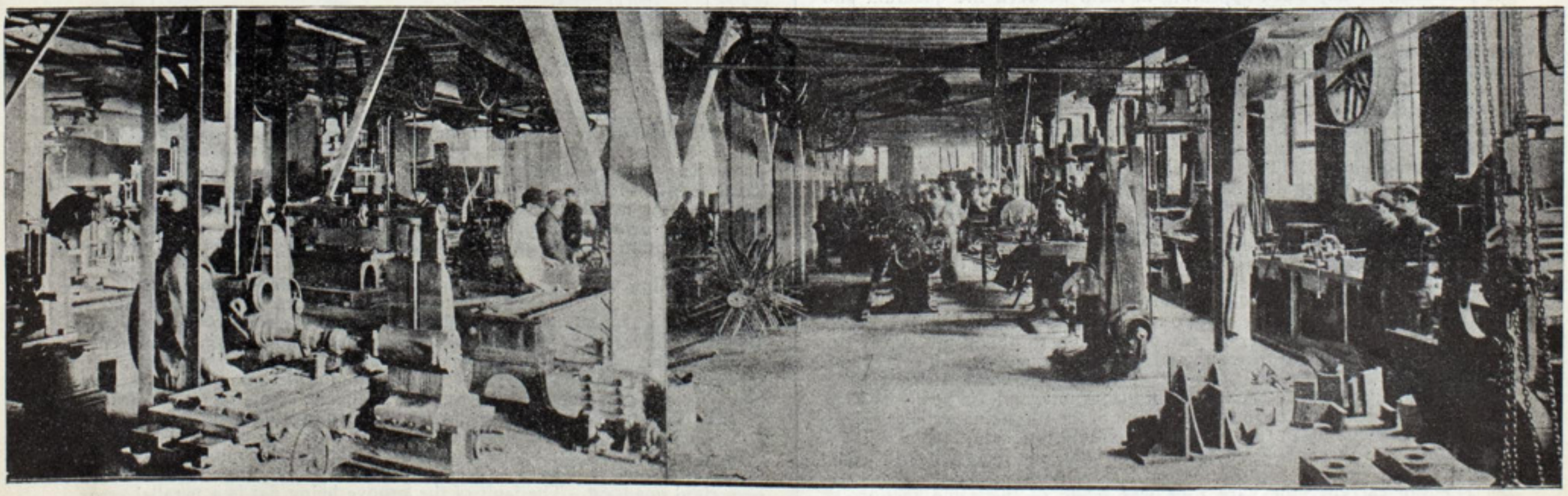
Thirty days after the fire in the engine and electrical departments of the B. F. Sturtevant Co. at Jamaica Plain, Mass., this enterprising concern had established new shops with a complete equipment of new tools, as is shown by a photograph of one of these departments taken on May 14. The fire, which occured on the morning of April 14, was fortunately confined to the building in which it originated and the fire wall about the power plant served to protect the same and the remainder of the buildings. The only damage resulting to the engine room was that due to wetting of the belt by water in the wheel pit. Fortunately the fire did not reach the patterns, and left the entire shipping facilities, together with the blower, heater, forge and allied departments, including the foundry, entirely undamaged. Large fire proof vaults on the three floors of the office building preserved intact all of the valuable drawings, correspondence, records, catalogue plates and cuts, so that by the next day business could be continued as usual, although in new quarters, which were immediately secured.

The floor space affected by the fire aggregated more than an acre in area, but as this represents only about one-fourth of the total floor space within the entire plant, it was a comparatively simple matter by a process of rearrangement to establish new shops for the injured departments in other buildings. Immediately after the fire, rush orders were placed for large quantities of new high grade machine tools and within a week these began to arrive. They were at once installed in their respective shops and belted to line shafting already in place and driven by local electric motors. This feature of power transmission by electricity greatly simplified the work of installation.

Three new shops have thus been established—one for heavy machine work, another for lighter work of a similar character and a third devoted to the uses of the electrical department. The offices have been repaired and are again occupied, open available spaces within the damaged buildings have been roofed over and work is now progressing much as though no fire had occured. In fact the fire brought with it some advantages, in that it compelled the replacing of many tools and enabled this company to equip its plant throughout with only those of the very latest design. Work will hereafter be turned out with even more accuracy and higher economy than before.

The illustrations presented on this page show the condition on the day of the fire of the engine and electrical departments of the Sturtevant plant as well as one of the new departments since been placed in operation.

PORTION OF STURTEVANT PLANT, DAY OF FIRE.



ONE OF THE NEW SHOPS OF THE STURTEVANT COMPANY THIRTY DAYS AFTER THE FIRE.

REORGANIZATION OF AMERICAN BRIDGE CO.

Complete reorganization of the American Bridge Co., a New Jersey corporation, and the American Bridge Co. of New York, was effected at meetings of the boards of directors of these companies in New York a few days ago. This action was occasioned by the merging of the two companies into the United States Steel Corporation. The action of the other constituent companies of the United States Steel Corporation was followed in reducing the number of directors of both companies and in changing almost entirely the personnel of the boards. Following are the new officers and directors:

American Bridge Co. of New Jersey—President, A. J. Major; vice-president, Wm. H. McCord; finance vice-president, J. A. Hatfield; contracting vice-president, C. C. Schneider; chief engineer, Paul L. Wolfel; mechanical engineer, James Christie; auditor, C. C. Price; treasurer, Wm. H. Connell; secretary, H. Schoonmaker; directors, A. J. Major, August Ziesing, James Christie, Paul L. Wolfel Robert J. Davis, A. L. Schultz, E. A. Muench, Abram S. Hewitt, Charles M. Schwab, Elbert H. Gary and Percival Roberts, Jr.

American Bridge Co. of New York—President, J. A. Hatfield; first vice-president, August Ziesing; second vice-president, C. C. Schneider; chief engineer, S. P. Mitchell; auditor, C. C. Price; treasurer, William H. Connell; secretary, H. Schoonmaker; directors, J. A. Hatfield, C. C. Schneider, James A. Huston, August Ziesing, J. P. Kennedy, E. A. Muench, A. J. Major, C. W. Bryan, Charles M. Schwab, Percival Roberts, Jr., S. P. Mitchell.

The American Bridge Co. of New Jersey has an authorized capital of $70,000,000 and operates about thirty bridge manufacturing plants. The American Bridge Co. of New York has an authorized capital of $100,000 and is the structural and contracting company. A. J. Major, the new president of the American Bridge Co. of New Jersey, has been for some time manager of the Pencoyd plant at Philadelphia, the largest and most important plant of the company. He now assumes the management of all the plants, but will retain his offices in Philadelphia.

BIGGER FIGHTING SHIPS

On the very day it was announced in Washington that the navy department was designing a monstrous armorclad of 16,000 tons, the London newspapers declared that the British admiralty would lay down this year three battleships of 18,000 tons. This is a notable advance over the size of present ships of the line-of-battle. Such vessels as the Oregon, Massachusetts, Indiana and Iowa in our navy unite heavy armor and a powerful battery with moderate size. The first three ships are of 10,300 tons and the Iowa of 11,300 tons displacement. Our later battleships are somewhat larger. The latest of all run as high as 15,000 tons, which is the size of the largest vessels of Great Britain. Our proposed 16,000-ton battleship represents a long step ahead, and the three British battleships of 18,000 tons are simply stupendous.

Of course, there is no technical difficulty in the way of building a 16,000 or 18,000-ton man-of-war. It would not be so large as the Deutschland or the Celtic. But one limitation upon the designers of warships has been the draught of water in harbors and docks. A merchant steamer built for the trade between New York and Liverpool may not need to enter any other port, but with warships for national defence it is different. The larger an armorclad is the deeper it must sink into the water in order to gain the proper equilibrium, for it necessarily carries not only its guns but most of its armor far above the water line. It was this consideration which moved our navy department to give its first armorclads only moderate dimensions. The Oregon and her sisters are ponderous but not unwieldy ships. They can enter many ports and steam through narrow waters. Their draught is less than that of foreign armorclads.

But increased size, generally speaking, means increased power, or, at any rate, it makes increased power possible. The three new British battleships will mount an enormous battery of four 12-in. and ten 6-in. guns, with a number of new type quick-fire 7.5-in., a model adopted because the British admiralty believes that 8-in. guns such as our armorclads carry are too heavy for rapid work. But this opinion of the British admiralty is not shared by our own navy department, for the design of our new 16,000-ton battleship calls for four 12-in., sixteen 8-in. and thirty-two 3-in. guns, a battery of which it is justly said that it is "not equaled by any fighting vessel ever constructed." Thus, though the new British armorclads will be larger than the American, they will be inferior in their battery power and fighting force. Our ordnance experts have developed an 8-in. gun of the true armor-piercing type which can be worked with great swiftness as well as with great accuracy. The British regard it as too heavy; our officers do not.

ITEMS OF GENERAL INTEREST.

It is again rumored in naval circles that Mr. Long contemplates resigning his position as secretary for domestic reasons, and that Charles H. Allen, now governor of Porto Rico and formerly assistant secretary of the navy, will in that event be appointed in place of Mr. Long.

Neafie & Levy, ship builders of Philadelphia, have informed the navy department that Miss May Chauncey Stevens of Grand Rapids, Mich., has been selected to christen the torpedo boat Chauncey. She is a great-granddaughter of Commodore Isaac Chauncey, after whom the vessel was named. Mrs. John L. Worden, widow of the hero of the Monitor, has informed the navy department that she has selected Mrs. Emelie B. N. Worden of New York City, her daughter-in-law, to christen the torpedo boat Worden, which will be launched at the works of the Maryland Steel Co., Sparrow's Point, Md., shortly.

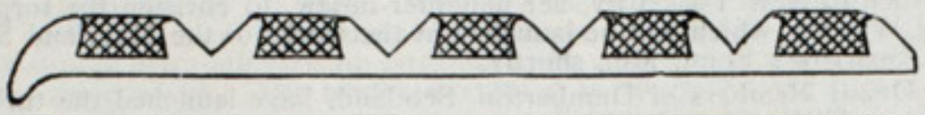
Denny Brothers of Dumbarton, Scotland, have launched the turbine steamer King Edward, which is destined for mercantile and passenger traffic on the Clyde. She is fitted with turbine engines similar to those of the torpedo boat destroyer Viper, the fastest vessel afloat. Mr. Parsons, the inventor of these engines, is confident of the extension of the principle, and that it will succeed eventually on Atlantic liners. The King Edward is equipped with three turbine engines working three independent shafts and five small screws. Altogether they have more purchase on the water than two of the usual kind. Large reversing motors are provided, and it is estimated that the vessel will have a sternward speed of 15 knots. The engines are of 4,000 H.P.

President C. M. Schwab of the United States Steel Corporation says that some of his statements before the United States Industrial Commission were misunderstood. Regarding his remarks on the iron ore situation, in which he intimated that the present supply will be exhausted in about sixty years, he says the known supply of high grade ores will be exhausted if the present ratio of increase in consumption continues, but adds that neither he nor any one else can tell what ore properties will be discovered. The facts are that Bessemer ores of the Lake Superior high-grade kind will be exhausted in much less time. None of this grade of ore has been found in Alabama or any of the other states. Search for it has been in vain within the past few years, except in a few cases where small pockets have been uncovered.

A very neat, well-illustrated and well-printed catalogue, just issued by the Marine Iron Co., a reliable machinery establishment of Bay City, Mich., describes their specialties and would prove a very valuable addition to collections of catalogues in the offices of vessel owners. The list of machines includes different types of hoists suited to marine purposes; a steam windlass, pile driving machine and ship yard jig mill, as well as several kinds of marine engines which the company has been making for years.

SAFETY TREAD FOR ENGINE ROOMS, STAIRS, ETC.

Attention is directed to the Mason safety tread for ship ladders, gangways, engine rooms, cabin stairs, etc., for the reason that it has been successfully used on the steamers Paris and St. Louis of the American line and on a large number of battleships and cruisers, including the Brooklyn, Iowa, Indiana, Massachusetts, Kentucky, Kearsarge, Minneapolis, Columbia, Philadelphia, Yorktown, Machias, Ranger, Bancroft and Lancaster. Upon the Indiana one of the turret platforms has been covered with the safety tread in place of rubber, making a perfectly non-slipping mat which is not affected by oil. It is argued in favor of this tread that it is a positive safeguard against slipping, whether dry or wet; that it is easily applied; that it will never become slippery and that it is very dur-



able. It consists of a base of hard rolled steel, from which rise ribs forming dovetail grooves. These grooves are filled with lead solidly rolled in, under heavy pressure, and firmly held by the dovetail. The surface of the lead is of equal height with the surface of the ribs, and can be worn down no faster than the steel is worn. The spaces between the lines of lead contain V grooves, which are an important factor in holding the foot, and also serve to collect all dust and dirt, which may be easily swept out. The tread is also made with a base of delta metal or hard brass composition, equally durable with the steel, which is largely used where an especially handsome appearance is desired. The brightness of the delta metal renders it especially desirable for ship use. The steel is usually galvanized.

In public buildings and in mercantile buildings all over the country the use of this material is very extensive. The headquarters of the American Mason Safety Tread Co. is at 40 Water street, Boston, and the factory at Lowell, Mass. Branch offices are maintained in New York, Chicago, Philadelphia, Cleveland, Cincinnati, Buffalo, Pittsburg, Portland and Washington and agencies at several other points throughout the country.

TRADE NOTES.

Chicago offices of the Fairmount Coal Mining Co. of West Virginia are now located in rooms 1268 to 1280 Old Colony building.

An order for forty-three stockless anchors, amounting to a little over 170,000 lbs., has been placed with the Baldt Anchor Co. of Chester, Pa., by the American Ship Building Co. (consolidated ship yards of the great lakes).

It is reported regarding the Ward line steamship Santiago, which was recently equipped with Sturtevant fans for forced draft, that as a result two Scotch boilers, under forced draft, are now doing the work which originally required four similar boilers, under natural draft, and further, that a fuel saving of four tons of coal per day has been made, the average revolutions increased by three per minute, and that a considerable portion of the space originally occupied by coal bunkers has now been converted into valuable freight conveying space.

The Boston & Lockport Block Co. of Boston, Mass., well known manufacturers of blocks for cargo hoists and other purposes, report a steady increase in trade, especially for blocks of large size and for trucks which they are selling on a large scale to new industrial enterprises all over the country.

Ship masters who have been annoyed by variation in readings of logs in cold weather, due to the lubricating oil of the log congealing, will be interested in knowing that the New Bedford Oil Co., East Boston, Mass., manufactures an oil specially suited to this purpose. The oil took the highest award—a gold medal—at the Paris exposition.

The American Bridge Co. will furnish two deck plate girder spans for the Nacozari Railroad Co. of Mexico; will furnish the Atchison, Topeka & Santa Fe railroad with a red rock cantilever bridge over the Colorado river, and will furnish the steel work for the Rogers hotel to be erected at the corner of Seventh avenue and Fifty-fifth street, New York City.

CHANGE OF TRAINS ON THE B. & O. R. R.

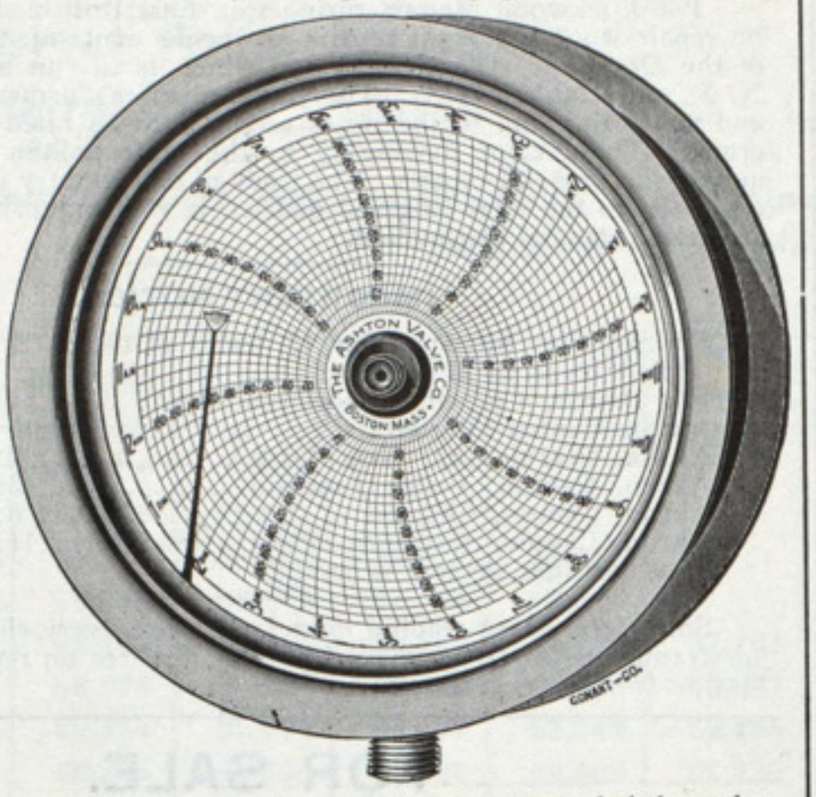
On and after Sunday, May 19, the through Chicago sleeper will leave Cleveland daily at 6:30 p. m., instead of 9:35 p. m., arriving Chicago 6:50 following morning. On same date a new train will be placed in service, leaving Cleveland daily at 11:20 p. m., arriving at Pittsburg 6:40 a. m., Washington 4:50 p. m., Baltimore 5:53 p. m., Philadelphia 8:15 p. m. and New York 10:40 p. m., with sleeper to Pittsburg and observation parlor and chair cars beyond, giving daylight ride through the historic mountain scenery. The afternoon train with through sleeper to Washington and Baltimore will leave Cleveland daily at 3:00 p. m., instead of 3:10 p. m. May 23

U. S. Engineer Office, Cincinnati, O., April 27, 1901. Sealed proposals for building 500 feet length of Chanoine dam of navigable pass at Dam No. 4, Ohio River, will be received here until 2 p. m., June 4, 1901, and then publicly opened. Information furnished on application to Wm. Martin, Resident Engineer, Davis Island Dam, Bellevue, Pa., or to this office. Wm H. Bixby, Maj., Engrs. May 23.

U. S. Engineer Office, Jones Building, Detroit, Mich., May 6, 1901. Sealed proposals for dredging, and other work required for removing obstructions to navigation in main Ship Channel between head of St. Clair and mouth of Detroit rivers, will be received here until 12 noon (Standard time), May 28, 1901, and then publicly opened. Information furnished on application. G. J. Lydecker, Lt. Col., Engrs. May 23.

ASHTON PRESSURE RECORDING GAGE.

The Ashton pressure recording gage, manufactured by the Ashton Valve Co., Boston, Mass., and illustrated in the accompanying engraving, is a combination, in the lastest form, of the pressure gage and a recording dial or chart. By its use an accurate record is secured, showing the exact pressure carried with its variations both day and night and with the time and duration of all changes. This device is suited to steam, water, air or gas pressure, and is a most valuable instrument to have for conditions in which a record of pressures is desired. In connection with steam boiler plants these gages serve as an incentive to careful firing, and insure steady steam and greater efficiency and economy. Any omission of duty or carelessness become recorded facts by the use of these gages. Paper dials to last a year and other supplies are furnished with the instrument.



MACHINERY EQUIPMENT OF RIVER STEAMERS.

The Marine Iron Works, Station A, Chicago, makes a specialty of designs for stern paddle wheel river steamers and of the manufacture of engines, boilers, etc., for such vessels. F. F. Friant of Yuma, Arizona, owner of the river steamer Retta, operates that vessel on part of the Colorado river where the waters are very heavily impregnated with mineral and other matter, a great portion of which is very fine but hard grit like emery. Writing to the Chicago concern, Mr. Friant says: "I only use my inspirator as a safety appliance and to fill up the boiler while standing with the heater not in service, for I must say that the pump you made for me has given most perfect satisfaction, and it has now seen a year of the very hardest kind of service." This refers to the type of outside packed plunger steam boiler feed pumps made by the Marine Iron Works and which is of especial interest to anyone having experience with independent steam boiler feed pumps used on river steamers. Mr. Friant's pump, however, was but part of the entire outfit which the Chicago firm built for him, relative to which the following is taken from a previous letter written at Needles, Cal.:

"Just made the round trip to Yuma (distance 550 miles), and although the current was running as high as 8 to 9 miles an hour at points which could not be avoided, I never struck a place on this river (there are few swifter) that could stop me, though I have seen the water roll clear over the forward deck. The machinery has never caused me an hour's delay, and I have put the boat to all kinds of hard work. For one trip I would be making the fastest time possible, running light with a party of mining men in a rush, and the next have her loaded to the guards with freight."

The fuel used is wood, the boiler being one of the direct-draft, internally fired, self-contained firebox type, made by the Marine Iron Works.

A MODERN STEEL FOUNDRY.

Attention was directed to the United States Steel Co. of West Everett, Mass., a short time ago on account of a report to the effect that the big Morgan industrial organization, the United States Steel Corporation, at first thought of adopting the name United States Steel Co., but found it had already been used by the Massachusetts concern. But the United States Steel Co. at West Everett, Mass., is by no means a small affair. It is under the direction of Mr. Eugene Edwards, who was for six years in charge of the General Electric Co.'s steel foundry at Lynn, where he was making 350,000 lbs. of castings a week. Products of the new West Everett works are known as Jupiter steel casting. The company recently closed a contract with the Fore River Ship & Engine Co. of Quincy, Mass., for all the steel castings that will be required in the battleships New Jersey and Rhode Island, to be built at Quincy. Several castings involved in this order will weigh 30 tons each. The foundry is 200 by 130 ft. and cost about $200,000. The equipment includes two 15-ton acid open-hearth furnaces, one 30-ton traveling crane and one 20-ton traveling crane, with side cranes to match. There are several air hoists throughout the plant, and the facilities are in all respects suited to the manufacture of castings of 1 lb. to 30 tons weight. A crucible plant, run in connection, is in operation practically night and day.

SOLVING THE TORPEDO BOAT PROBLEM.

A board of naval officers appointed to devise a scheme of practical usefulness for the large torpedo flotilla which will soon be added to the navy has gone to Pensacola, Fla., where it will hold a meeting for the purpose of considering the advisability of establishing a series of torpedo stations along the Atlantic coast. The plan for the uniform distribution of the torpedo boats is still in embryo, but is generally looked upon with favor by the officers themselves. What to do with these little craft has been a problem to the navy department for some time, and it is believed that the plan of the board will finally solve the question. This plan contemplates the establishment of three main divisions, one along the North Atlantic coast at probably New London, Conn.; another at Port Royal, S. C., and a third at Pensacola, Fla. These points are merely suggested so far, and it is the purpose of the present trip of the board to determine more definitely what points offer the best facilities for torpedo-boat rendezvous. As soon as these three main stations have been established the board will recommend that other smaller stations contiguous to them be authorized, thus forming a continuous line of defense along the entire Atlantic coast line.

The Lockwood Manufacturing Co., East Boston, Mass., is very busy on repair work. General repairs are being made on the Prince Edward of the Dominion Atlantic line and which is to run between Yarmouth, N. S., and Halifax, N. S. The yacht America, formerly a cup defender, and now belonging to the Ames estate, is to be fitted out for a summer cruise. The Hector, belonging to the Metropolitan Coal Co., is also undergoing general repairs. The trade of this country in propeller wheels, especially in the New England district, is very extensive, and the wheels are giving general satisfaction.

IMPORTANT NOTICE.

On and after Sunday, May 19, trains of the B. & O. R. R. will depart from Cleveland as follows:

For Akron, Canton, Valley Junction	7:15 a. m. daily
Akron, Canton, Marietta	11:00 a. m. ex. Sun.
Akron, Washington, New York	3:00 p. m. daily
Akron, Canton, Valley Junction	3:25 p. m. daily
Akron, Canton, Chicago	6:30 p. m. daily
Akron, Canton, Pittsburg, Phila., New York	11:20 p. m. daily

Note changes present schedule. May 23

Some interesting reading matter relative to very shallow draft powerful steamboats for river navigation is mailed free on receipt of request by Marine Iron Works, station A, Chicago. 5

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Trigg, Wm. R. Co.....Richmond, Va.
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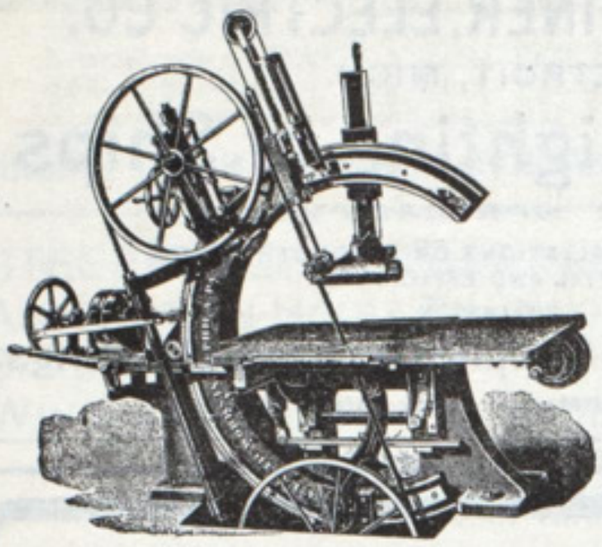

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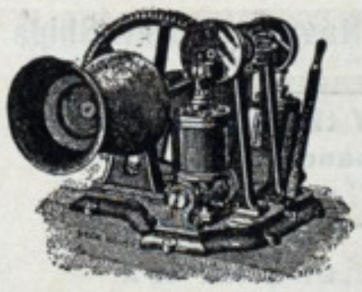

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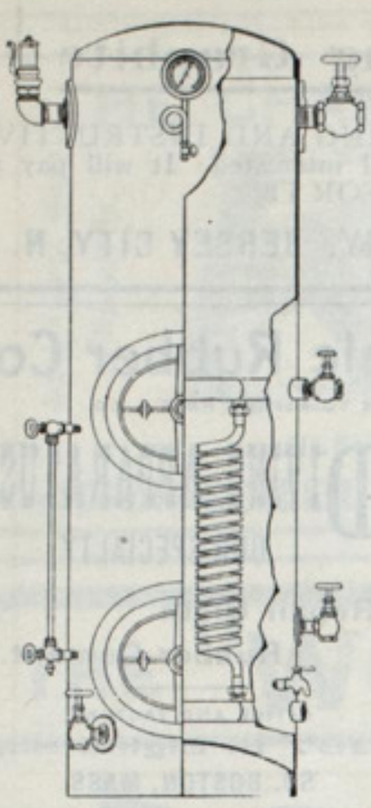

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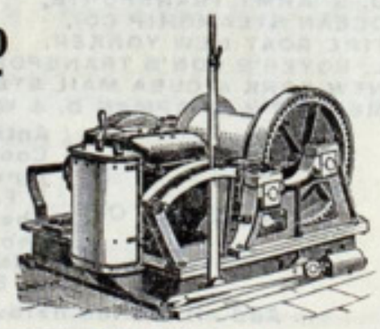

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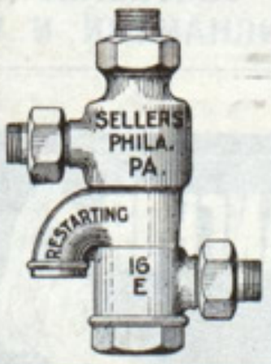

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